No. 173. Vol. XXXVI. Part 3. JULY, 1951.

GEOGRAPHY

FORMERLY THE GEOGRAPHICAL TEACHER.

THE QUARTERLY JOURNAL OF THE

GEOGRAPHICAL ASSOCIATION

Central Office :
c/o The Park Branch Library,
Duke Street, Sheffield, 2.
(Telephone : 25946.)

LONDON :
PUBLISHED FOR THE GEOGRAPHICAL ASSOCIATION BY THE LONDON GEOGRAPHICAL INSTITUTE
MESSRS. G. PHILIP AND SON, LTD., 32, FLEET STREET, E.C.4, AND PRINTED BY
PERCY BROTHERS, LTD., THE HOTSPUR PRESS, MANCHESTER ; AND AT LONDON.

PUBLISHED ONCE A QUARTER. PRICE TO NON-MEMBERS, 3/6 NET

CONTENTS.

Page

Iron and Steel Industry in South Africa. Peter Scott 137

Wattle Industry in Natal. Dylys Birkby 150

Ruhr Area : A Problem in Definition. N. J. G. Pounds 165

Geography in the Dissenting Academies. H. Robinson 179

Two Drainage Diversions in Dorset. B. W. Sparks 186

Globe Segment. F. V. Botley 193

Universal System of Map Referencing. B. C. Widdowson .. 198

Correspondence 201

Geographical Association 202

Geographical Association—Balance Sheet, 1950 205

Reviews of Books 208

Reviews of Text Books 217

Geographical Articles in Magazines Received 218

N.B.—The Authors alone are responsible for the opinions expressed in their articles.

GEOGRAPHICAL ASSOCIATION, 1951.

President : Mr. Leonard Brooks, M.A.

Past-President : Professor L. Dudley Stamp ; *Vice-Presidents :* Mr. J. Fairgrieve, Professor H. J. Fleure, Professor J. F. Unstead, Mr. T. C. Warrington.

Trustees : Lord Rennell, Professor J. L. Myres, Mr. L. Brooks.

Hon. Treasurer : Sir William Himbury.

Hon. Auditor and Librarian : Mr. T. C. Warrington.

Hon. Secretary : Dr. Alice Garnett.

Hon. Editor : Professor D. L. Linton.

Hon. Annual Conference Organiser : Mr. W. G. V. Balchin.

Council : Officers (listed above) ; Chairmen of Committees (see below) ; Branch Representatives (see Standing Order 1 (1)) and the following elected members : Professors S. H. Beaver, H. C. Darby, S. W. Wooldridge, Dr. E. W. H. Briault, Misses E. H. Bennetton, E. M. Coulthard, Messrs. P. R. Heaton, D. A. Hill, J. C. Larkinson, J. A. McIver, L. S. Suggate, M. J. Wise.

Executive Committee : Sir W. Himbury, Professor H. J. Fleure, Professor D. L. Linton, Dr. A. Garnett, Messrs. W. G. V. Balchin, L. Brooks, J. Fairgrieve, T. C. Warrington ; *Section Representatives :* Messrs. J. B. Goodson. M. Murphy, A. E. Smailes, H. H. Starr, C. B. Thurston ; *Members Elected by Council :* Miss E. M. Coulthard, Dr. E. W. H. Briault, Messrs. P. R. Heaton, J. A. McIver, Professor S. W. Wooldridge.

Maps Officer : Mr. N. K. Horrocks.

Hon. Assistant Editor : Mr. N. Pye.

(*continued on inside back cover*)

All correspondence, including manuscripts or other communications concerning *Geography*, but excluding matters properly addressed to branch secretaries, should be sent to The Assistant Secretary, Geographical Association, The Park Branch Library, Duke Street, Sheffield, 2.

All correspondents requiring a reply should enclose a stamped addressed envelope.

THE IRON AND STEEL INDUSTRY OF SOUTH AFRICA

PETER SCOTT*

THE growth of the South African iron and steel industry, which has derived much of its impetus from gold mining, is entering a new phase. With increasing demands for steel from the developing mines of the Far West Rand and, more especially, the Orange Free State goldfield, the principal steel market has moved southwards. Although Pretoria, where the South African Iron and Steel Corporation (Iscor) was established in 1934, furnishes three-quarters of the present steel output (nearly 650,000 tons in 1949), Vereeniging, well placed to serve both the Rand and Free State goldfields and well endowed with facilities for industrial development, bids fair to become the major steel district. In 1944 Vanderbijl Park, ten miles west of Vereeniging, was bare veld ; to-day it contains blast furnaces, a steel plant, engineering works, and a fast-growing town of 20,000 inhabitants. If the planned capacity of the steelworks, which far exceeds the combined capacities of the other nine plants in the Union, is fully developed, imported steel, which on the Rand now costs 75 per cent. more than locally produced steel, will be completely ousted from the inland market. Ultimately, Vanderbijl Park may well become a modern industrial city of 200,000 inhabitants[1]. On the eve of such striking expansion it seems appropriate, first, to review briefly the rise of the iron and steel industry and, secondly, to examine the four locations of the industry in relation to raw materials and the shift in the market. (Fig. 1.)

RISE OF THE INDUSTRY

The emergence of the Transvaal steel industry dates from the period 1910–1925. Of the four plants successfully established between 1910 and 1916, three were located on the Witwatersrand goldfield and one, the only one to receive government assistance, was located on the Vaal river at Vereeniging ; all four depended upon the railways and mines both for supplies of scrap and for their principal markets. The First World War, which severely curtailed iron and steel imports, gave a fillip to the industry, but with the post-war depression and collapse in steel prices, further expansion was handicapped through the difficulty of raising capital overseas. Nevertheless the Union Steel Corporation (Usco) of Vereeniging succeeded in raising sufficient capital to take over a blast furnace which was nearing completion at Newcastle in Natal and to build an additional steel plant on the

---

* Mr. Scott spent the three years 1942–45 in South Africa as an R.A.F. pilot, and since 1947 has been Lecturer in Geography in the University of Capetown. He wishes to express his indebtedness to the South African Iron and Steel Corporation, the African Metals Corporation, the Union Steel Corporation, and the Dunswart Iron and Steel Works, for their courtesy in supplying statistics and other information.

[1] G. Rayburn, " Vanderbijl Park," *Iscor News*, vol. 15, 1950, p. 765.

Klip river at Vereeniging ; both the Newcastle and Klip works came into operation in 1926.

The period 1926–1940 was characterised not only by a continued expansion of the Transvaal steel industry but also by the development of pig-iron manufacture. In Natal, two-thirds of a century had elapsed since the first project for the reduction of local iron ore had been advanced, and a quarter of a century since the first smelting experiments had been successfully concluded. Although in 1922 a system of bounties had been introduced to encourage the production of pig-iron and steel from South African ores, the terms of award were such that the Newcastle plant received little benefit. Unlike the coastal industry of Australia, which struggled throughout the twenties even behind a high tariff wall, the South African industry, located far inland near the main market, enjoyed not tariff protection but the natural protection afforded by high transport costs on overseas imports. If Newcastle lay midway between the coast and the Rand, Pretoria, at that time universally held to be the most favourable site for an integrated iron and steel plant, would obviously enjoy far greater protection. Between 1918 and 1921 an experimental blast furnace at Pretoria had been successfully operated. In 1925 a commission appointed by the Gutehoffnungshütte, a large German iron and steel concern, reported that a plant at Pretoria would be a commercial proposition, but in the following years its establishment, far from being considered primarily as an economic measure, became largely a political issue. By 1928 Iscor had been organised not as a private company receiving Government assistance but as a public undertaking. It began producing in March, 1934. The Newcastle blast furnace, unable to compete with Iscor, was blown out in November. Whereas Newcastle had used high-grade coal and low-grade ore from Natal, Pretoria mainly used low-grade coal and high-grade ore from the Transvaal.

Meanwhile, South Africa's abandonment of the gold standard in 1932 had stimulated gold mining activity which in turn led to a greatly increased demand for steel. Within five years steel consumption had multiplied threefold. In 1937, when South Africa produced one-third of the 869,000 tons of iron and steel absorbed by the domestic market, Iscor alone contributed 92 per cent.[2] In the same year the African Metals Corporation (Amcor) was formed as a subsidiary of Iscor to take over the Newcastle blast furnace, which was blown in again in 1938. By 1940, in spite of a steadily expanding market, South Africa was producing three-fifths of her iron and steel requirements. Since 1930 production had increased sevenfold.

Throughout the forties expansion was accelerated by war-time and post-war conditions. As a result of mass production and standardisation total output more than doubled, but the salient feature of the period, despite the difficulty of obtaining specialised plant from overseas, was

---

[2] C. S. Richards, *The Iron and Steel Industry in South Africa*, Johannesburg, 1940, p. xxxi.

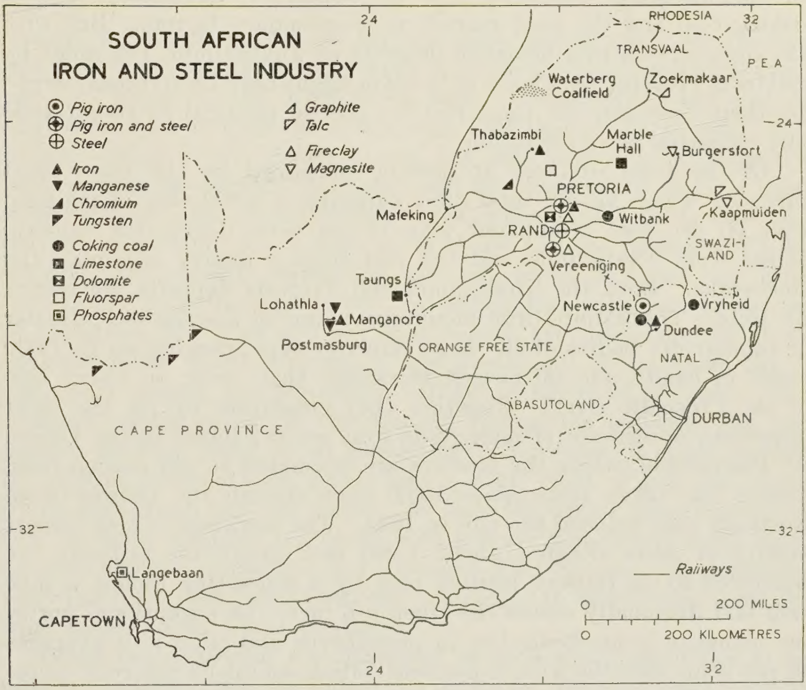


Fig. 1.

the development of ferro-alloy manufacture and the making of special steels. At the same time, as the principal iron and steel market shifted southwards, Vereeniging became the most favourable location for the establishment of additional steelworks. Accordingly, the Ferro-Alloy Works were established there by Amcor in 1941 and the steelworks at Vanderbijl Park by Iscor in 1943. On the Rand the producing mines were supplied with specialised steel products by Scaw Alloys Ltd., whose plant had been located at Alberton in 1942, and by Scaw Products Ltd., formed in 1946 to take over the Chamber of Mines Steel Products Ltd., whose works had been established at Driehoek in 1916. At Pretoria and Newcastle alike, plant was expanded and output increased. Whereas since 1939 steel prices in Britain and the United States, even before sterling devaluation in 1949, had risen by 60 to 100 per cent., prices of South African steel have risen by only 33 per cent. Thus to-day the Transvaal steel-producing region, which forms a compact area stretching some 70 miles from north to south and 30 miles from east to west, enjoys, and will doubtless continue to enjoy, great prosperity. Nevertheless each of its three locations remains distinct, as also the Newcastle iron-producing centre, in its production trends and areal significance.

The Pretoria Iron and Steel Centre

In the first instance the choice of Pretoria as the location for an integrated iron and steel plant depended primarily upon the presence of medium-grade quartzitic iron ore deposits ; proximity to both coking coal and the steel market were secondary factors. But with the discovery of rich hematite deposits at Thabazimbi, 156 miles by rail from Pretoria, the choice of location might have been reconsidered ; by then, however, the issue had become so political as to preclude any impartial reconsideration.

Of the total iron ore at present consumed by the three blast furnaces, which have a total daily capacity of 1,800 tons of pig-iron, over 90 per cent. (compared with 75 per cent. during the thirties) comes from Thabazimbi and the rest from a quarry adjoining the steelworks. Both the Thabazimbi and Pretoria deposits are owned by Iscor. Thabazimbi (iron mountain) is one of a series of lenticular or tabular ore bodies of the Lake Superior type, ranging up to 1,000 yards in length and 50 feet in thickness, that occur on either side of the Crocodile river[3]. Together they constitute by far the most important occurrence of high-grade iron ore yet found in the Union. At Thabazimbi, where the reserves are estimated at 200 million tons, mining has taken place since 1931, even though the railway from Northam only reached the site in 1934. The workings, which consist mainly of adits situated about 1,000 feet above the railhead, are connected to the railway loading bins by a self-acting incline a mile long laid diagonally across the steep hill face. Of exceptional purity the hematite is markedly low in phosphorus and silica ; it averages 66 per cent. metallic iron, 3 per cent. silica, and 0·03 per cent. phosphorus. Because it is also exceptionally dense, close-grained, and therefore difficult to smelt, and because the silica content is so low that the slag is not viscous enough to flow readily when drawn from the furnace, the hematite is mixed with easily-reducible siliceous ore averaging 50 per cent. metallic iron and nearly 20 per cent. silica[4]. Sedimentary siliceous ore occurs throughout the central and eastern Transvaal. At Pretoria, where it forms the crests of hills south of the city and attains its best average grade, the bed is about 12 feet thick. At the Iscor quarry reserves amount to 30 million tons, but for South Africa as a whole they total 5,900 million tons[5].

Coking coal is obtained from the Navigation colliery of the Witbank coalfield in the south-eastern Transvaal and from the Durban Navigation collieries of the Klip River coalfield in northern Natal. The Witbank field, in which the proved reserves of coking coal amount to only 170 million tons, is 70 miles by rail from Iscor ; the Klip River field, in which proved reserves are only 110 million tons[6], is 270 miles from Iscor. In general, the five main seams of the Witbank field, of which only the second and fifth in ascending order contain coking coal, occur nearer the surface, have better roofs, are thicker, less disturbed, and more easily worked by mechanical equipment than the two seams of the Klip River field. Consequently the cost of Transvaal coal at Pretoria is less than half that of Natal coal. Unfortunately, however, Transvaal coal has such poor coking properties that varying proportions of Natal coal are required to make a good metallurgical coke. From 1934 to 1941, when blend coking coal was derived solely from No. 2 seam at Witbank and the methods of coke making were steadily improving, the proportion of blend coal used rose from 75 to 97·5 per cent. Subsequently, with increasing use of coal from No. 5 as well as No. 2 seams, the proportion of blend coal has fallen to 80 per cent. ; and eventually, if coal from No. 5 seam only is used, the proportion will fall to about 65 per cent. The straight coking coal from the Durban Navigation collieries has the highest swelling index of all Natal coals. Moreover, it is the richest in volatile hydrocarbons which give a high yield of gas and other by-products from the coke ovens. At Iscor the coking plant comprises two batteries totalling 102 ovens with a daily capacity of 1,400 tons. In recent years production has averaged 370,000 tons. In addition, Iscor has since 1936 purchased coke amounting to 50,000 tons annually from independent Natal producers.

---

[3] P. A. Wagner, " Report on the Crocodile River Iron Deposits," *Geol. Survey Memoir No.* 17, Pretoria, 1921, p. 31.

[4] C. J. N. Jourdan, " Another Source of Iscor's Ore : The Quartzitic Quarry," *Iscor News*, vol. 1, 1936, p. 355.

[5] P. A. Wagner, " The Iron Deposits of the Union of South Africa," *Geol. Survey Memoir No.* 26, Pretoria, 1928, p. 198.

[6] *Report of Coal Commission* 1946–47, Pretoria, 1948, p. 29.

Other raw materials are consumed in such small quantities as to have no bearing upon the industry's location. Because limestones in the Union are neither plentiful nor conveniently situated for industrial use, blast-furnace limestone has to be brought 120 miles by rail from Marble Hall, which necessitated the construction of the Marble Hall–Tuinplaats line in 1934, and steel-furnace lime 317 miles from Taungs[7]. However, dolomite, used raw as a flux in the blast furnaces and calcined as a lining material in the steel furnaces, comes from the nearby Quaggapoort quarry. Fluorspar, which lowers the melting point of the flux, increases its fluidity, and helps to remove impurities, is available in the Warmbaths district. Manganese ore from Lohathla is used in basic iron manufacture, and zinc from Broken Hill in Northern Rhodesia for galvanising in the sheetworks. Graphite and talc are obtained from Zoekmakaar and Kaapmuiden respectively, acids and chemicals from Modderfontein, and refractory materials from Olifantsfontein and Vereeniging. Although Vereeniging manufactures magnesite bricks from the low-iron, amorphous variety of magnesite obtainable in the eastern Transvaal, the iron and steel industry depends mainly on imported bricks made from crystalline magnesite because they give a better performance at high temperatures.

Almost the entire pig-iron production is consumed in steel manufacture. Apart from a small electric furnace, the plant consists of four open-hearth furnaces used in conjunction with two acid Bessemer converters in the duplex process of steel production ; the total capacity is about 1,400 tons of steel per day. Cold scrap, mainly from the rolling mills, is added to the charge. Since the rolling mill capacity exceeds the melting shop capacity by as much as 300,000 tons per annum, an increase in open-hearth capacity, which would in the long run lower production costs, has been suggested[8]. The mill equipment comprises a blooming mill with an annual capacity of 800,000 tons, heavy and medium rail and structural mills, light merchant bar and rod mill, small sections mill, sheet mill, wireworks, and a 3,000-ton forge press. In 1949 the output of rolled, drawn and forged products totalled nearly 482,000 tons, of which 69,000 were blooms, billets, and slabs and the rest finished products. The semi-manufactured steel was re-rolled or manufactured into special lines elsewhere, and 45,000 tons of standard lines were used in construction work at Vanderbijl Park. Sales of pig-iron amounted to less than 100 tons. Iscor's products, together with those of Usco and Amcor, are marketed by a joint sales organisation.

---

[7] See W. Wybergh, " The Limestone Resources of the Union," *Geol. Survey Memoir No.* 11, Pretoria, 1918 (vol. I) and 1920 (vol. II).

The extent of Iscor's market, as in fact the market for all southern Transvaal producers, has depended largely upon railway rating policy[9]. In general, finished iron and steel goods, though they make for efficient loading and cheap carriage, are carried in the highest tariff classes by the South African Railways. These high railage charges, adjusted so as to favour traffic from one inland centre to another and, more especially, from an inland centre to a coastal area, have not only accorded substantial protection to the iron and steel industry but also deterred it from carrying out effective rationalisation. Nevertheless, until war-time conditions brought about an increase in the landed cost and a decrease in the volume of imported steel, Iscor was unable to compete in the coastal market ; even to-day, only the inland market, fortunately much larger than the coastal market and largely unsatisfied, seems to be assured. In Northern and Southern Rhodesia, the most obvious export market, the railage rates favour traffic through Beira rather than through Mafeking, the difference being most marked for traffic to the Northern Rhodesian copper mines. Consequently, overseas producers dominate the market. At present Iscor exports small quantities of finished steel to Southern Rhodesia, but even these exports will be substantially reduced by the present expansion of the iron and steel plant at Que Que[10].

---

[8] " Investigation into the Iron, Steel, Engineering and Metallurgical Industries in the Union of South Africa," *Board of Trade and Inds. Rept. No.* 286, Pretoria, 1946, p. 5.

[9] See " An Analysis of Railway Rating Principles and the Effect of Transport Costs on Industrial Development in the Union," *Board of Trade and Inds. Rept. No.* 285, Pretoria, 1946.

[10] The capacity of the Rhodesian Iron and Steel Commissions' plant at Que Que is being raised from 33,000 tons of finished steel in 1950 to 109,000 tons in 1953. At present the plant consists of a blast furnace, an open-hearth furnace, and two Bessemer converters. Located near plentiful deposits of iron ore and limestone, it obtains coking coal from Wankie, 500 miles away, and electricity from Umniati. Eventually coal will be brought by a specially-constructed railway from Sebungwe, where a Scottish coal mining company is developing recently-discovered deposits. By 1953 Redcliffe, the new steel town near Que Que, will have 12,000 inhabitants.

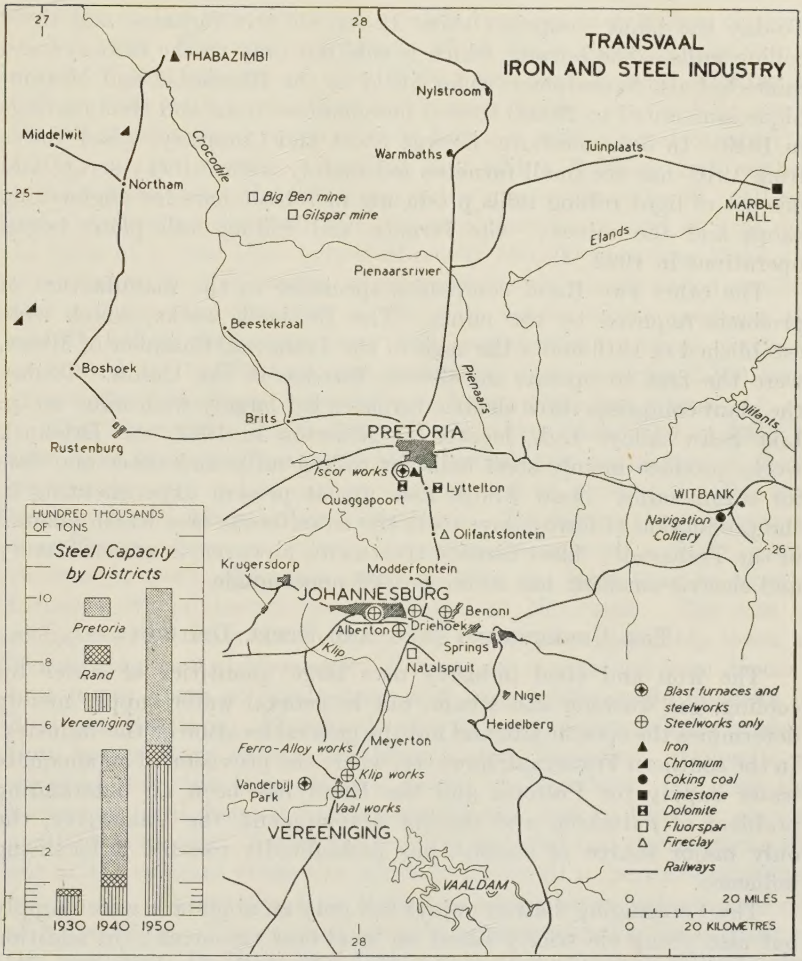


Fig. 2.

The Witwatersrand Steel District

Although steel-making on the Witwatersrand has been confined to small-scale operations, it is significant that the four Rand companies are the only steel-producing firms in South Africa that have been established without government assistance. All four use steel scrap supplemented whenever necessary with Iscor or more usually Amcor pig-iron. The Dunswart Iron and Steel Works, established on a 30-acre site at Benoni in 1911, was the first company to undertake steel smelting in the Union. At first the plant produced mainly wrought iron from railway scrap, but after 1920, with increasing substitution of steel for wrought iron in the engineering industries, the products consisted almost entirely of high-grade basic steel.

To-day the plant comprises three 12-ton electric furnaces and three rolling mills. The output, which is sold not only to the railways and mines but also to customers as far afield as the Rhodesias and Mozambique, amounted to 29,000 tons of merchant sections and steel castings in 1949. In Johannesburg, George Stott and Company, which dates from 1910, has six small furnaces fed mainly with railway scrap, and one set of light rolling mills producing merchant bars for engineering shops and the mines ; the furnace and rolling mill plant began operations in 1922.

The other two Rand companies specialise in the manufacture of products required by the mines. The Driehoek works, which were established in 1916 under the ægis of the Transvaal Chamber of Mines, were the first to operate an electric furnace in the Union. To-day the plant comprises three electric furnaces fed largely with mine scrap. Like Scaw Alloys Ltd., located at Alberton in 1942, the Driehoek works produce mainly steel balls for rolling mills and shoes and dies for stamp mills. Scaw Alloys Ltd. are at present experimenting in the production of ferro-alloys from the titaniferous ores which abound in the Transvaal ; blast furnace treatment, however, is unsatisfactory and electric smelting has so far proved uneconomic.

The Vereeniging Iron and Steel District

The iron and steel industry uses large quantities of water for cooling, gas washing and steam, but in general water supply merely determines the specific site and not the general location of the industry. In the southern Transvaal, however, where the provision of an adequate water supply for Pretoria and the Rand has been an outstanding problem of industrial and mining development, the Vaal river, the only major source of supply, has undoubtedly exerted a localising influence.

The Vereeniging district enjoys not only an abundant water supply but also cheap electricity based on local coal resources ; in addition it is well-placed relative to the present shift in the steel market. But in 1913, when Usco established its steelworks on the Vaal river, Vereeniging was as remote from the principal market as from the principal raw materials. Although the Government had approved the site, its location had been chosen more for private than for economic reasons. At first the Vaal works used only railway scrap, but from 1926 to 1934 Newcastle pig-iron provided 22 to 30 per cent. of the charge, from 1934 to 1938 Pretoria pig some 40 per cent., and after 1938 Newcastle pig about 50 per cent. During the forties, owing to Iscor drawing upon the limited scrap supplies available, an increasingly higher proportion of pig to scrap became necessary. Usco, like most other steel producers in South Africa, obtains refractory materials from a plant adjoining the Vaal works.

Since Usco is a relatively small producer, it has of late specialised in the production of tool steels and quality products. At the Vaal works the plant comprises three open-hearth furnaces with a total capacity of 120 tons and three electric furnaces each with a capacity of 3·5 tons. The mill equipment, which has a monthly capacity in excess of the furnaces of over 6,000 ingot tons, is kept working to full capacity with Iscor billets and Amcor ingots. At the Klip works the plant consists of seven electric furnaces with a total capacity of 1,700 tons per month, a cogging mill and a finishing mill with a combined capacity of 1,250 tons, and a continuous-rod mill. All rod not absorbed by the steel wire drawing machines is sold as wire rod. In 1949, of a total Usco output of nearly 100,000 tons, four-fifths was produced at the Vaal works, whose products are mainly rolled sections and castings, and one-fifth at the Klip works, whose products are mainly hollow drill steel, steel and copper wire. Copper products accounted for 13,770 tons and manganese steel castings 2,350 tons. A subsidiary company manufactures bolts, nuts, and rivets.

The Vereeniging Ferro–Alloy Works were established in 1942 to take over from the Newcastle blast furnace the production of ferro-manganese with a low carbon content and to produce for the first time in South Africa other ferro-alloys. The initial plant comprised four electric furnaces. Since ferro-manganese with a high carbon content is more efficiently made in blast furnaces than in electric furnaces, its production has continued at Newcastle. The cost of manganese ore from the Postmasburg district is appreciably lower at Vereeniging than at Newcastle. Chrome ore is obtained from Amcor's own mines north of Rustenburg and from higher-grade deposits in Southern Rhodesia. High-grade quartz, used in ferro-silicon production, comes from various localities in the Transvaal. Dolomite is supplied from the Corporation's quarry at Lyttelton. To meet the increasing local demand for ferro-manganese and to have a surplus available for export, Amcor has recently installed two electric furnaces, not at the original works site which is too small to permit expansion, but on a 1,150-acre site near Meyerton, about seven miles north-east of Vereeniging. The original plant is at present being transferred to the new site. In 1949, of a total production of nearly 27,500 tons, about 45 per cent. consisted of steel ingots, 37 per cent. ferro-manganese, 15 per cent. ferro-silicon, 2 per cent. ferro-chrome, and 1 per cent. silico-ferro-manganese. As soon as all six furnaces have been installed at Meyerton, output will be substantially greater ; and eventually, when the steelworks at Vanderbijl Park reach full production, output will consist entirely of ferro-alloys, tungsten carbide, and mild and stainless steel.

Whereas the Iscor works at Pretoria have been unable to expand owing to a restricted site and an inadequate water supply[11], the Vanderbijl steelworks have been located on a 6,100-acre site on the Vaal river. The plant will have an initial ingot capacity of 350,000 tons per annum, an initial rolling capacity of at least 240,000 tons, and ultimately an overall capacity of one million tons. It will comprise seven batteries of by-product coke ovens each with a daily coking capacity of 600–700 tons, four blast furnaces each with a daily pig-iron output of 800–850 tons, seven open-hearth furnaces with Bessemer plant operating on the duplex process, a combined blooming and slabbing mill, a medium plate mill, a semi-continuous hot-strip mill for sheets and tinplate, heavy and light section mills for structural sections and rails, merchant bar mills, and possibly a wide plate mill for rolling the heaviest plates likely to be required. A separate blooming mill, together with the sheet mill from the Pretoria works, will be added later. Raw materials are to be drawn from the sources supplying the Pretoria works. Sufficient tinplate will be produced to meet the requirements of the rapidly-expanding canning industry. Already the steelworks, which have only just begun producing, have attracted other industries to Vanderbijl Park. Among the more important are Dorman Long (Africa), whose works will construct bogie wagons for the railways of southern Africa, and the Van der Bijl Engineering Corporation, a subsidiary of Iscor which, by arrangement with British and American firms, is manufacturing heavy engineering plant and equipment.

---

[11] Although an ample supply has been made available since 1947, it has to be pumped at considerable expense from the Vaaldam near Vereeniging.

THE NEWCASTLE IRON CENTRE

The low cost of assembling the raw materials for an iron and steel industry in northern Natal led to the establishment of a 150-ton blast furnace at Newcastle in the early twenties. The northern Natal coalfields contain the only deposits in South Africa of straight coking coal. Moreover, the region contains substantial deposits of comparatively rich Coal Measure ironstone which in places have a high lime content and can be worked by open-cast methods. Although only small quantities of the ore now used at Newcastle comes from northern Natal and the rest from Manganore and Thabazimbi, the local ore is sufficiently cheap to mine, sufficiently self-fluxing, and sufficiently high in iron content to offset the far greater haulage cost of the hematite ore ; consequently, the ore costs per ton of pig-ron at Newcastle are comparable with those at Pretoria. Originally limestone was brought some 400 miles from Taungs[12], but later dolomite from Natalspruit was successfully substituted and to-day dolomite is obtained from Lyttelton. Phosphate rock was formerly imported but now comes from Langebaan ; it is used in the production of phosphoric pig-iron[13]. Manganese ore is brought from Postmasburg. To facilitate the assembly of raw materials, the plant was erected on a site adjoining the main railway line at Newcastle. The original furnace, which was shut down in 1945 when a new mechanically-operated 300-ton furnace was put into operation, was loaded entirely by hand labour ; native labour, efficient and surprisingly amenable

---

[12] T. N. Dewar, "The South African Iron and Steel Industry," *Proc. Third (Triennial) Empire Min. Met. Congress*, Part III, Johannesburg, 1930, p. 410.

[13] In 1943 Amcor formed a subsidiary company to manufacture phosphate fertiliser at Bellville, near Capetown. Production, which averages 50,000 tons annually, fluctuates considerably with the demand.

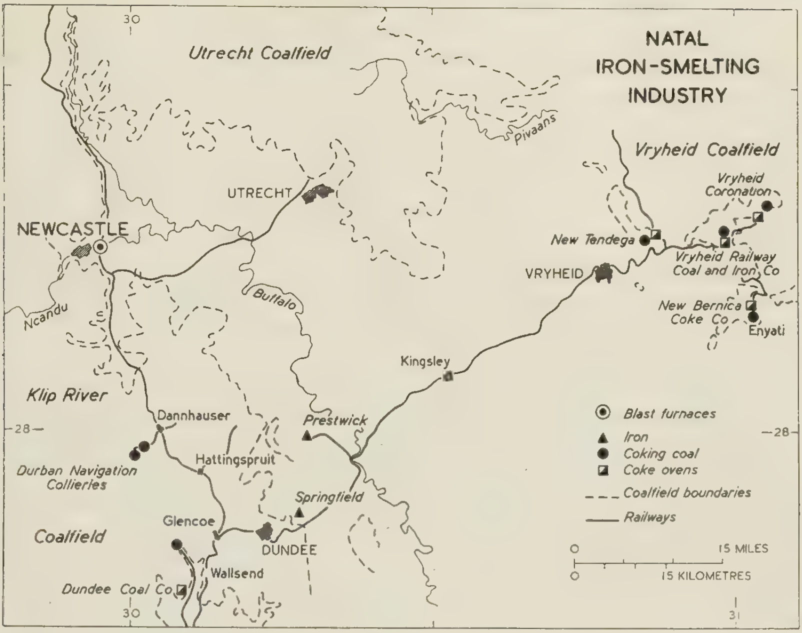


Fig. 3.

to works discipline, was sufficiently cheap to make mechanisation if not uneconomic at least unnecesssary. Skilled labour was initially recruited from Britain and Australia. An adequate water supply has been drawn from the nearby Ncandu river.

In the Klip River coalfield the stratified Coal Measure ironstone, associated with a thin coal seam occurring about 200 feet below the main coal horizon, outcrops extensively along the western slopes of the Buffalo River valley. East of the main outcrop, especially north-east of Dundee, numerous outliers occur of which the most important are the Prestwick and Springfield deposits. At Prestwick, on the slopes of Inyanyatwa mountain, the ore body ranges from 3 to 10 feet in width, is almost horizontal, contains little water, and has a hard sandstone roof. The outcrop furnished an oxidised ore containing 55 per cent. metallic iron, but as the workings grew deeper the iron content fell to only 40 per cent. To save railage, the iron content was raised to 58 per cent. by calcination, but subsequent experiments showed that the furnace could be more economically operated if charged with raw carbonate. At Prestwick and Springfield reserves are small, and other outlying deposits workable by opencast methods contain only a few million tons. Although the ore bed underlies the main coal horizon over an area of roughly 600 square miles, the cost of mining such relatively low-grade ore at depths of as much as 1,000 feet will almost certainly prove prohibitive. It is possible, however, that adit mining in the Buffalo River valley may pay.

From 1938 to 1948 about two-thirds of Newcastle's ore requirements came from Thabazimbi, but since 1948, when the original blast furnace resumed operations and ore requirements were greatly increased, Manganore has ousted Thabazimbi as the major source of supply. At Manganore the high-grade hematite deposits form part of a series of ore bodies, found almost invariably capping isolated hills and ridges, that occur in an area extending some 40 miles northwards from Postmasburg. The ore, like that at Thabazimbi, is exceptionally pure ; it averages 60 per cent. metallic iron, 3·3 per cent. silica, and 0·01 per cent. phosphorus. Though closely associated with manganese deposits, it rarely contains as much as 0·5 per cent. manganese. Ore reserves total 28 million tons.

Although the blast furnaces at Newcastle are located within fifteen and probably within five miles of coking coal deposits, coke is brought 115 miles by rail from the Vryheid Coronation collieries. The Vryheid coalfield, which accounts for half the coking coal mined in Natal, contains coal poor in volatile matter, so that in the past coke was made entirely in open-burning beehive ovens from which by-products are not recoverable. Recently, however, coke has also been made in modern by-product carbonising plant which gives a higher yield of coke with a lower ash content. Even so, the cost of coke remains higher at Newcastle than at Pretoria. Apart from the Vryheid Coronation plant, there are four other centres of coke manufacture in Natal, but only one-third of Natal coke, or one-tenth of the coking coal output, is consumed by the iron and steel industry. Since the proved reserves of straight coking coal amount to only about 150 million tons, the fact that 70 per cent. of the total output is sold for purposes other than coke-making has been a major cause for concern. In 1946 a Coal Commission was appointed to investigate the possibility of conserving the remaining supplies for purposes for which coking coal is essential. The Commission concluded, however, that the time had not arrived for legislative action, and recommended that a detailed survey of potential resources not only in the extensive Klip River field but also in the vast unexplored Utrecht field, should be undertaken as soon as possible.

Situated midway between Johannesburg and Durban, Newcastle was originally chosen as the most suitable location for a blast furnace partly because it would facilitate access to export as well as internal markets. In practice, however, despite the low cost of assembling raw materials at Newcastle, the high cost of distributing the finished products has hampered development. Until World War II, overseas producers could undersell South African pig-iron in the coastal markets, and could even compete successfully on the Rand. From 1926 to 1934 Newcastle's production in excess of Vereeniging's requirements could not be marketed in sufficient quantities to keep the furnace in continuous operation, but since 1938 the entire output has been readily absorbed by the Vereeniging and Rand steelworks, the Rand gold mines, railways, and private foundries. Production costs have in fact compared favourably with those at Pretoria, despite the difference in size of plant, in degree of mechanisation, and in extent of vertical integration. In 1949 the two furnaces together produced nearly 150,000 tons of pig-iron.

The Resource Base and the Future

Although South Africa's iron ore reserves are adequate to support a large-scale iron and steel industry, the known reserves of coking coal are far from adequate. At the present rate of consumption, proved reserves will last for less than 50 years ; once the steelworks at Vanderbijl Park reach full production, this period will be appreciably shortened. Nevertheless substantial reserves, though more costly to mine than deposits at present worked, may yet be found in the Klip River and, more particularly, the Utrecht coalfields, but outside Natal the only region where straight coking coal may occur in sufficient quantity is the Waterberg coalfield, about 80 miles north of the Thabazimbi railhead. Here coal reserves are enormous, but the coal consists mainly of blend coking coal and non-coking steam coal ; straight coking coal, so far as is known, occurs in small quantities requiring special treatment. Moreover, the mixed nature of the seams, the accumulation of underground water in the coal-bearing strata, and the distance from railhead, will long militate against commercial development.

Even if, as a result of exploration and prospecting, coking coal reserves are eventually augmented, water resources will perforce remain limited. The Vaal river, the only major source of supply in the southern Transvaal, furnishes water not only to the industrial and domestic consumers of the Vereeniging district but also to the Rand and Free State goldfields. During the forties the consumption of Vaal water more than doubled, and if industrial and mining expansion continues at the present rate, by 1975 all available water will have been allocated.

Despite these disquieting conditions, South Africa has developed, and is in the process of expanding, an important iron and steel industry. At Pretoria, on the Rand, and at Newcastle, further large-scale expansion is unlikely, but Vereeniging, abundantly supplied with water and cheap electricity, may well become prominent not simply for pig-iron and steel production but more distinctively for ferro-alloy manufacture. The Union possesses abundant raw materials for the manufacture of ferro-manganese, ferro-silicon, ferro-chrome, ferro-tungsten, and ferro-titanium. Instead of being the world's leading exporter of manganese ore, South Africa may emerge as the world's leading exporter of ferro-manganese. Meanwhile, the greatly increased supply of cheap steel made available by the establishment of the steelworks at Vanderbijl Park will not only lower costs in the gold mining industry but also facilitate the development of secondary industry—a development which, in view of the eventual decline in gold mining, is vital to the future economy of the Union.

THE WATTLE INDUSTRY IN NATAL

M. DYLYS BIRKBY*

THE wattle is indigenous to Australia but almost all the wattle bark and extract involved in international commerce derives from South Africa, mainly in the province of Natal where the Black Wattle (*Acacia mollissima*) was introduced from its original home in 1838 by John Vanderplank, the first Englishman to farm there. Previously, as a trader between Australia and Natal, Vanderplank had observed the treelessness of the veld and the exposure of the Boer farms to the hot summer sun and bleak winter winds, and it was perhaps for this reason that he carried the seeds of a wild, apparently useless thicket shrub—the Black Wattle[1]—to Natal and planted them around the home he established at Camperdown, between Durban and Pietermaritzburg. The rapid growth of his trees was noted by the trek-Boers who spread the seed along the trek-routes between their summer pastures on the highveld and the winter pastures in Natal. In 1884 Sir George Sutton sent a few bundles of wattle bark to England for chemical analysis. The results were favourable ; English tanners were interested and commercial planting began. By 1905 there were 30,000 acres under wattle in Natal and the value of its exports—tons extract and bark—had reached £70,000 per annum. Furthermore, in that year T. R. Sim, Conservator of Forests, was able to write " Wherever it exists it is the only timber industry giving a full return within a few years and keeping that up in perpetuity."[2] This prediction has been fully justified : after a further forty years of export the value has increased seventy times.

In addition to the Union of South Africa, Australia, Java, Tanganyika, Kenya, Rhodesia, Madagascar and Morocco produce wattle bark but, Kenya excepted, production is negligible. Kenya bark production is 7 per cent. of that produced by the Union and the production of extract is 16 per cent. ; but Kenya is not a serious competitor for its products are inferior. The wattle industry is easily the most important of the forest industries of the Union and 70 per cent. of the wattle acreage is in Natal. The remainder lies chiefly in the Transvaal.

---

* Miss M. D. Birkby spent the years 1947–1949 in South Africa teaching geography at the Wykeham School, Pietermaritzburg. During her vacations she made a special study of the Natal Wattle industry in the field and since her return to England has successfully presented a thesis on this subject to the University of Leeds. She is at present assistant geography mistress at Bolling Grammar School, Bradford.

[1] Other varieties of wattle have been introduced from Australia but the Black Wattle alone merits consideration in any discussion of the wattle industry.

[2] T. R. Sim, *Tree Planting in Natal*, Natal Dept. of Agric. Bull. No. 7, 1905, ch. xi, pp. 124–148.

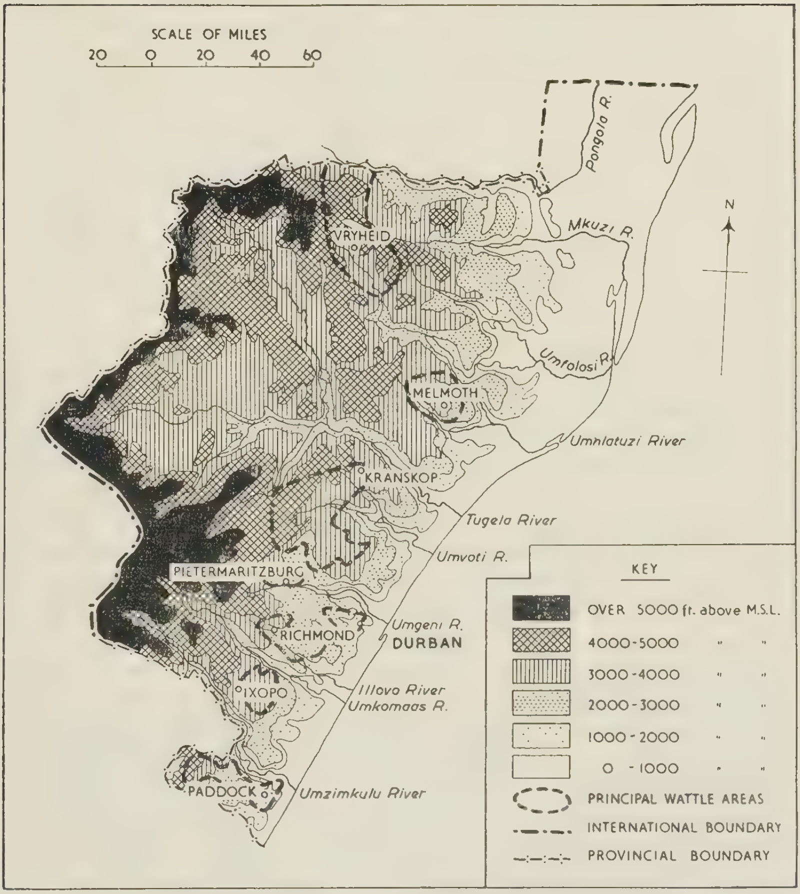


Fig. 1.—Wattle areas and physique of Natal.

The Distribution of Wattles

The " Wattle Belt " of Natal lies on the high ground of the Midlands region (Fig. 1), beyond fifteen and within seventy miles of the sea. This can be usefully visualised as crescent-shaped, extending from Paddock in the south (30 deg. 47 min. S), north through Ixopo and Richmond to Pietermaritzburg (lying in the centre of the Belt), New Hanover, Greytown and Kranskop. Beyond Kranskop the land drops 3,000 ft. in the Tugela Gorge, rising on the other side to the well-dissected district of Zululand. The gorge breaks the continuity of the crescent for beyond it, in Zululand, is another important wattle area around Melmoth. The total distance from Paddock through Pietermaritzburg to Melmoth is some 180 miles. The Vryheid—Paulpietersburg wattle area in northern Natal (27 deg. 26 min. S) is an outlier of the Wattle Belt stretching towards the Transvaal border, across which lie the important Piet Retief plantations.

The Belt falls within the natural region of the warm temperate forest of Natal which extends from Highflats to Kranskop. Before wattles became established the area was actually under grass veld but it is believed that, until felled to build wagons and early homesteads, it supported Yellow-wood forest. Such forest still prevails in the predominantly broken terrain of the Melmoth District of Zululand, but elsewhere the Yellow-wood survives only as natural bush on the deep, uncultivable *kloofs* or steeper mountain-sides. In the south the Paddock district is sandy country sprinkled with bush, whilst in the north the Vryheid district is largely sandy " sourveld." In both these districts wattle cultivation is perhaps less successful than in the natural forest region.

Whilst wattles will grow throughout Natal, commercially successful plantations are confined to the Wattle Belt. Altitude, aspect, climate and soil conditions combine to determine its location, the first is the prime influence, for the others are attendant upon it. Wattle trees grow well between 2,000 and 4,500 ft. above sea level. These two contours enclose two distinct levels or steps in the Great Escarpment as it rises towards the Drakensberg, plus the intervening slope. The lower level is the Pietermaritzburg peneplain extending from Kloof (1,800 ft.) to Pietermaritzburg (2,300 ft.) and from Harding near the Umzimkulu River in the south to Kranskop, overlooking the Tugela, in the north. Wattles are grown on the raised rim along the eastern edge of this peneplain, but immediately behind is a rain shadow of thornveld which precludes plantations. On the western edge of this peneplain the land rises abruptly to 4,000 ft. : plantations clothe this whole slope from 2,500 ft. up to the eastern margin of the second level. Within the Pietermaritzburg peneplain, however, there are numerous *tafelburge* (monadnocks) rising to about 4,000 ft. whose flat tops are, where accessible, occupied by wattle plantations, whilst thornbush covers their precipitous slopes. Moreover numerous deeply-incised rivers flow from west to east across the Belt ; for example, in the south the Umzimkulu River forms a great gorge 3,000 ft. deep, whilst the Tugela River in the north separates Natal from Zululand.

The Wattle Belt is not therefore a continuous one nor do wattles grow everywhere within the limits of the above-mentioned altitudes, aspect being another important limiting factor. Wattle trees are always grown on east and south-east facing slopes to catch the maximum rainfall from the trade winds. Other trees such as pines may be detected amongst plantations clothing the undulating slopes and ridges ; closer observation reveals that they occupy the dips in the topography, where any cold air would settle or frost occur. Both are dangerous to young wattle trees and more than 5 deg. F. of frost generally kills them. The occurrence of frost also decides the upper limit for wattle trees, for during winter it is common above 4,500 ft.

Temperature also helps to determine the lower limit ; high summer temperatures such as those experienced on the coastal plain increase the rate of transpiration too rapidly. Within the Belt, however, mist tempers the summer heat and reduces transpiration to a minimum. Mist is even more common at 4,000 ft. but at this altitude there is a greater danger of frost. Below 3,000 ft. mist is rare ; intense heat and land and sea breezes prevent its formation. Absence of mist more than any other single natural factor defines the lower limit of wattle cultivation, since it is regarded as an invaluable asset by wattle growers. Wattle trees, in brief, require a warm temperate climate with no great extremes of heat or cold.

Table I shows average monthly temperatures for 1940 at six places in different parts of the Belt.

TABLE I

Station	Alt. (ft.)	Jan.	Feb.	Mar.	Apl.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Paulpietersburg ...	3,650	69.2	**70.4**	68.7	63.9	58.4	54.2	**53.3**	59.3	63.4	64.2	66.3	**70.5**
Melmoth	2,496	71.5	**74.7**	72.1	68.3	65.1	60.5	**59.0**	63.5	65.1	66.1	68.0	71.9
Greytown	3,643	69.4	**71.2**	68.6	64.1	61.1	55.7	**54.9**	60.2	62.3	63.2	65.3	69.3
Howick	3,450	68.9	**72.1**	68.5	62.1	58.1	53.3	**51.6**	59.4	62.7	63.5	66.3	69.7
Pietermaritzburg ..	2,243	71.5	**75.0**	71.8	66.8	62.6	57.9	**56.6**	63.1	65.3	65.9	68.8	72.1
Paddock	1,685	70.2	**73.4**	70.9	67.9	65.5	61.9	**61.4**	64.9	63.7	65.8	65.8	70.4

Since, however, extreme rather than average temperatures are more often significent to plant life, Table II gives these for Howick and Pietermaritzburg and serves to illustrate the kind of weather which may occur in the Belt.

TABLE II

Station	Alt. (ft.)	Jan.	Feb.	Mar.	Apl.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Howick	3,450												
Extreme	max.	90.4	95.0	93.0	84.9	83.7	81.6	81.6	87.0	90.3	96.5	96.0	**97.8**
Extreme	min.	50.0	49.4	49.0	35.9	37.3	27.0	**25.8**	36.2	40.6	38.6	40.0	53.0
Pietermaritzburg ..	2,243												
Extreme	max.	91.4	96.6	96.2	90.0	85.8	85.0	85.4	89.4	93.6	99.0	**100.0**	96.0
Extreme	min.	54.0	53.4	53.2	42.4	44.0	33.0	**32.3**	41.2	47.0	43.2	44.0	56.4

Few areas of Natal receive less than the thirty inches required for tree growth in these latitudes but for commercial wattle planting thirty-five is a recognised minimum. Between September and March the south-east Trades blow strongly from the Indian ocean. Rain falls in heavy downpours often accompanied by thunder and hail ; run-off is rapid and evaporation high, reducing the effectiveness of precipitation. Rivers may flood and soil be washed from slopes. Accordingly the planting of wattles is beneficial ; their roots bind the soil and leaf waste provides a spongy mat which absorbs moisture. Should hail occur severe damage to the trees may result and consequently most wattle farmers avoid known storm tracks. Hailstones, rough and sometimes three inches in diameter, will score the bark of trees on the edge of a plantation and sever smaller branches. In addition to retarding the growth this reduces the value of the bark and makes stripping more difficult. Snow is rare within the Belt, although increasingly common as the Drakensberg is approached. When it occurs growth is again checked and after the trunks of trees thus retarded have developed they may show a severe bend which also creates difficulty for stripping operations.

Table III gives precipitation during 1940 for the same places as those listed in Table I. This being a normal year the winter drought was not severe, ten to fifteen inches of rain falling between April and September, whilst only July and August were dry.

TABLE III

Station	Jan.	Feb.	Mar.	Apl.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Paulpietersburg ...	4.64	2.44	3.61	2.19	3.10	2.19	0.01	0.07	3.63	2.02	6.14	7.43	37.47
Melmoth	4.05	0.52	3.27	1.87	8.82	3.00	0.01	0.32	2.32	1.58	5.48	11.74	42.98
Greytown	6.00	4.44	1.94	2.00	6.91	2.55	0.02	0.02	4.30	1.59	7.18	10.50	47.45
Howick	5.10	4.40	3.85	0.91	5.36	2.88	0.00	0.00	2.45	3.08	4.19	8.40	40.62
Pietermaritzburg ..	3.19	2.87	4.60	1.12	5.25	2.95	0.07	0.02	2.20	2.50	5.48	7.74	37.99
Paddock..........	2.87	2.77	3.79	3.05	10.53	0.76	0.08	0.48	2.54	2.04	9.14	4.94	42.99

In some years under ten inches of rain may fall between April and September and when this occurs the foliage of the wattle canopy becomes scorched. Yet in Australia it survives pronounced drought. Perhaps there wattles are not so crowded in stands ; certainly the foliage is less developed on wild trees, so that loss through transpiration is probably reduced. It has been observed that the worst infestations of the bagworm, the chief pest of the cultivated wattle, are experienced after a prolonged dry spell. Yet drought and its consequences are never sufficiently serious to compel irrigation even as a precautionary measure.

In addition to its direct influence upon wattle cultivation climate also affects the development of the soils of a region and these, in turn, the effectiveness of its rainfall. For wattles the chemical composition of the soil is much less important than its depth and drainage, which are closely related to the characteristics of the parent rock.

Broadly speaking, the Wattle Belt seems to coincide with outcrops of Ecca Shales with doleritic intrusions and, where faulting has taken place, of some Table Mountain Sandstone. The Ecca Shales, consisting of soft, dark blue shales and flagstones, occur in the Karroo system of rocks and extend throughout this part of Natal, thinning northwards. The Table Mountain Sandstone is found in the Cape system and consists of massive sandstones and quartzites, the upper beds often containing soft greenish banded clays or dark slates, easily weathered. According to Osborn[3] clay soil is generally associated with the Ecca Shales and dolerite of the Richmond, Hilton Road, New Hanover and Greytown districts. A loose open clay, not easily puddled, it rarely cracks except when very dry. It has a high moisture-holding capacity, absorbs rain readily and, unless very wet, is easy to work. Repeated ploughing, however, renders it very loose and "floury," especially when dry, because of the loss of humus, and serious erosion generally follows. Sometimes the decomposed shale is encountered in the fourth foot ; sometimes at twenty to thirty feet and, as it has a columnar structure, it disintegrates slowly. The first wattles were originally planted on such deep soils where they continue to flourish.

The Table Mountain Sandstone generally occasions sandy loams, found along the eastern border of the Wattle Belt. It is loose and friable in the virgin state and likely to blow under cultivation. Its depth varies from several feet to two or three. Admixture of particles from the Old Granite series improves its qualities. Field observations have shown that wattle soils are frequently similar to laterite. Lateritic pans do in fact occur but are avoided for plantations. Opinions vary as to the amount of deterioration of soils under wattle cultivation over the last eighty years, but increased acidity is generally recognised. This, it is thought, increases susceptibility to frost and experiments are being made to counteract it.

---

[3] J. B. Osborn, "Some physical properties of the wattle soils of Natal," *S. Af. Jour. Sc.*, vol. xxviii, 1931, pp. 207–221.

All these natural factors in their different combinations have given rise to a classification of sites for wattle plantations differentiated according to the quality of the bark which it is considered they could produce. First, second and third quality sites may thus be distinguished. The value of classification is that it enables a more uniform method of silviculture to be devised for each different type of site which, if adopted, would facilitate the grader's task when he finally estimates the bark quality.

The Cultivation and Products of the Wattle

Wattle farms in Natal can be divided into three categories : (*a*) large plantations (2,000 to 5,000 acres) on estates owned by the nearby municipality, or by private companies—manufacturers of wattle extract—reaching back to the sources of supply, or by individual owners growing wattle exclusively ; (*b*) moderately large plantations (1,000 to 2,000 acres) on farms concerned also with animal or crop husbandry ; (*c*) small plantations (100 to 1,000 acres) on farms dependent primarily on dairy or arable produce.

The wattle farmer aims to produce thick bark with a high tannin content. Bark off a stem one inch in diameter is merchantable ; if left long enough a tree will develop a diameter of two feet and a height of ninety, by which time the bark is very thick. It takes fifty years, however, to acquire such proportions and meanwhile the bark becomes corky although the yield by weight may be considerable. In practice the tree is held to be at its best, in terms of maximum yield of bark of high quality, after about ten years and accordingly plantations are organised on a ten-year cycle. Thus a farmer with a thousand acres of wattles will strip a hundred acres annually. Under the present stimulus of high prices, however, they have tended to strip after seven or eight years, notwithstanding that yield per acre increases with a long cycle.

Before sowing for the first cycle the land must be ploughed. The furrows usually follow the contours, especially on steeper slopes. Oxen are commonly employed but the use of tractors on flatter land is increasing. Ploughing is usually to a depth of three or four inches, though this depends somewhat on former usage. Thus if land has been heavily grazed previously it is likely to be closely compacted, which necessitates ploughing to a depth of seven inches to bring to the surface the mineral constituents essential for the nourishment of the young seedlings. After ploughing the land is left fallow for about three months. It is then ready for the seeds or seedlings, as the case may be.

Planting may be done at any time immediately after adequate rains, but late January or February is considered the best, since by planting during this period the rank mid-summer growth of annual grasses is avoided. Planting in the winter tends to retard germination. Seeds may be sown directly and covered with one to two inches of soil by a machine planter at the rate of 2½ to 4 lb. an acre, and this is the commonest method; alternatively, seedlings are transplanted by hand from prepared seed-beds. As the seeds are very resistant to heat, germination is very slow unless they have been first treated, usually by immersing them in boiling water before planting. Formerly seeds were broadcast but they became so scorched as they lay on the surface that germination was too profuse, making subsequent thinning difficult, and hence the practice was abandoned.

R. P. Stephens[4] states that rate of growth in the first eighteen months depends upon the amount of available phosphorous in the soil. Certainly applications of even small amounts of superphosphate fertiliser markedly accelerate the early stages of development and in so doing enable the young trees to rise quickly above ground frost level. It is therefore usual to apply 200 lb. of superphosphate an acre in the first two years. Thereafter, however, root competition is severe and moisture supply probably becomes the dominant factor controlling rate of growth. Seventy-five per cent. of the feeding roots of wattle trees are in the top foot and, as lime is regarded as their chief requirement, the application of a calcium-rich fertiliser is of the greatest importance. Other fertilisers used are sulphate, factory ash and kraal manure. Fertilisers, however, should be looked upon as a means not only of stimulating tree growth but also for preventing soil exhaustion and erosion.

Weeding also involves the danger of soil erosion, for the roots of weeds undoubtedly help to bind the soil. In the heat and humidity of summer weed growth and re-growth is very rapid and some experts believe that if left alone they would choke themselves out. However, one good cleaning of the plantation by hand-hoe or disc-harrow in the first year after planting is usual. Subsequently, until the trees are eighteen months old, it is considered necessary to clean only along the lines of the trees and to remove surplus wattle growth; thenceforward the canopy of foliage thickens and closes, discouraging further weed growth.

Wattle seeds germinate prolifically and very soon the seedlings have to be thinned out according to the number of trees per acre desired for the final stand. The usual distance between the rows in Natal is six or seven feet, with a wider interval every sixth row to facilitate exploitation, but arrangements vary somewhat in different areas and there may be as much as twelve feet between the trees on some plantations. The closer the rows the greater the amount of selection when the plantation comes to be thinned. However, there seems to be no uniformity in this connection, so divided are opinions concerning the optimum number of trees per acre required to obtain the best bark yield. Numerous experiments have been performed and many are in hand but none can yet be regarded as conclusive, owing to the difficulty of being sure that all the conditions of climate, soil and aspect are uniform over all the plots under investigation. The length of the wattle cycle is a further difficulty, for research workers must wait ten years for results.

---

[4] R. P. Stephens, "Mining Timber in South Africa, with special reference to Wattle Silviculture," *Jour. S. Af. For. Assn.*, No. 4, 1940, pp. 55–74.

In the early days, about sixty years ago, trees were thinned out to six hundred per acre and yields were good. This encouraged an increase of trees per acre, but they soon became spindly and their bark thinner. In 1928 A. J. O'Connor and Dr. Ian Craib,[5] Forestry Research Officer for Natal, stressed the importance of early and heavy thinning. They recommended that trees should be finally spaced out at six months and that stands should contain 400 trees per acre or 250 on first-quality sites. They also advocated long rotations of up to sixteen years. In 1941 Craib still adhered to a count of 250 to 400 trees per acre but he stated that trees should be thinned out to 1,200 per acre within four to six weeks of germination and 250 to 400 before the end of the second year.

In 1933 some of the large estates planted blocks of 400 trees per acre and some of 300, but by 1938 the owners were not satisfied with the results. During the war these growers planted 500 trees per acre and 600 on first-quality sites and have since increased these numbers to 600 and 700. Nor do they do any thinning until the trees are six or eight feet high, when they reduce the stands immediately to 700 per acre; any further selection depends upon the rate of growth. The objection to such late thinning is that root systems become so well developed that, in removing surplus trees, the roots of the rest may be damaged and this is one possible cause of disease.

A large number of trees per acre provides tall straight timber and thin bark, whereas a smaller number gives stockier trees but thicker bark. Hence a few farmers, concentrating on timber, rather than on bark production, have as many as 1,000 trees per acre. Most, however, follow Craib and, more recently, S. P. Sherry, now Silviculturalist at the Wattle Research Institute, in adopting 400 trees per acre, with six thinnings in the first two or three years carried out mostly in winter only. Doubtless site quality should determine spacing. Growth on all sites is at much the same rate for the first four years but between four and six years on those of first quality it exceeds that on second quality sites and, in turn, on the latter it surpasses that of third quality sites. The bark yield being the essential aim, the common practice is to have a greater number of trees per acre on third quality sites than on first to ensure that the ultimate yield of the two will be approximately equal. This unquestionably impoverishes the soil on third quality sites even further.

---

[5] A. J. O'Connor and I. J. Craib, "Silvicultural Investigation of the Black Wattle," *S. Af. Jour. of Sc.*, vol. xxxi, pp. 1929, 235–246.

Experiments have been conducted to try to determine what should be the total bark yield per acre from trees of different ages at different counts per acre. Findings indicate that on a first quality site on a fourteen-year cycle a count of 450 trees gives the maximum return ; on the ten-year cycle, that prevalent in the industry, the best result comes from a count of 650 trees per acre. On a second quality site the maximum yield after fourteen years is again from a count of 450 trees per acre but on the ten-year cycle from 550 trees per acre. On a third quality site 350 trees per acre furnish the best return on a fourteen-year cycle but on the ten-year cycle 450 trees per acre give the highest yield. It also appears that the rate of increase slackens after the tenth year on all sites and this, undoubtedly, governs the length of the cycle commonly adopted.

In terms of the timber value of a plantation Stephens[6] favours 400 to 500 trees per acre, maintaining that this number allows for losses from frost or pests, controls the development of excessively large, crooked, unsaleable branches, produces a good bark yield and the modest diameter required by the mines, the principal market for timber. He adds that if the whole wattle industry adhered to a fixed thinning regime it would result in the over-production of certain timber sizes and under-production of others. Since, however, the industry is almost solely concerned with bark production, a plantation is customarily felled, regardless of timber size. Felling is done mainly with an axe but certain experiments are being made with a "see-saw," a machine with a revolving blade driven by a motor. Much speedier, a "see-saw" will cut through a tree in a matter of minutes, but its use is not always practicable on steeper slopes. Before felling trees are first incised to about four feet from the ground and the bark removed from this level to the root collar. This is done partly because of the ease with which the bark can be stripped at this height and partly to save bark from being wasted by the axe in the process of felling. By stripping to the root collar the death of the remaining stump is ensured and the development of coppice shoots prevented. The felled log is then stripped, the bark being first prised from the bole with the axe and then divided into four-foot lengths. Branches of more than one inch in diameter are also stripped. The remaining brushwood is stacked into lines and the bark is pressed into bundles ten to thirteen inches in diameter and four feet long and carried to the roadside to be weighed. All this work, from felling to carrying the bark to the road, is done by the stripper whose average production is 700 lb. a day.

Bark thus bundled and despatched immediately after felling is called "green bark." Some farmers prefer to dry the bark before forwarding it to the factory as "stick-bark" ; this reduces bulk, an important consideration if the farm is distant from the factory. Indeed bulk thus lost amounts to about half the original weight. Drying, which involves exposing the bark to the sun and air for four or five days, may be done in one of several ways. The bark may be laid out in strips on the ground, flesh-side downwards, or draped over a rack formed of tripods and crosspoles. Alternatively poles may be placed on the ground and bark laid over them so that the air can circulate round the strips ; or wires may be strung between stumps five feet high and bark nicked and threaded thereon after the manner in which tobacco leaves are dried.

---

[6] *Vide supra.*

The timber, really a by-product of the industry, may be sent to a saw-mill or disposed of directly from farm to mine or other industrial concern making the purchase. The private companies, concerned only with bark production, sometimes employ contractors to remove the timber at a nominal price whilst, if the plantations are at an uneconomic distance[7] from the railway, the timber simply remains on the ground to rot.

Thus the first cycle is completed and if production averages seven tons of green bark per acre—or four tons of stick-bark—and twenty tons of timber, the farmer is satisfied.

Bark and timber from the felled section having been disposed of, the land must be cleaned. The brushwood waste is stacked in lines which usually lie between the seventh and eighth rows selected for the next generation of trees and generally follow the contours so that a hillside often presents a terraced appearance. The farmer then awaits the germination of the seeds already in the soil, deposited there in millions every year by the trees of the previous cycle. If the waste is piled at such an interval there is enough of it to prevent any germination beneath the brushwood which would of course be undesirable. If, as in the Melmoth district of Zululand and certain remoter parts of Natal, the timber is not sold from the plantation it has to be included with the brushwood, which is then piled along every fourth row. To pile it along every seventh row, as elsewhere, the stumps of the felled trees would have to be six feet high to support it and would take a long time to decay, since these lines of " slash " remain for the whole cycle and are only completely rotted when the plantation is ready for felling.

Undoubtedly this waste timber and even the brushwood cause considerable inconvenience and is one reason why some owners and farmers prefer to burn over the whole plantation between each cycle. Another is the fear of fires, especially in the dry season, and where lines of brittle timber are left between the trees it is impossible to insure the plantation. Some say that " Nature burns " to dispose of dried-up waste ; others regard burning as necessary to ensure a rapid and dense re-generation of wattle seeds, as these respond readily to heat. Nevertheless, after three years, growth gives no indication of whether a plantation has been burnt over or not. The time and cost of stacking the slash, if it is not burnt, also increase production costs. They may be counterbalanced, however, by the additional labour required to thin out the trees after the dense re-generation consequent upon the burning over of the site. The practice of burning over a plantation prior to re-establishment was universal amongst wattle farmers until about twenty years ago, and until I. J. Craib[8] pointed out forcibly at the British Empire Forestry Conference in 1935 that the practice "resulted in marked sheet erosion, soil desiccation and soil deterioration." This view, recently upheld by S. P. Sherry,[9] has now been accepted by most farmers.

---

[7] In general more than nine miles.

Wattle farms are organised on a plantation basis under a European manager or owner-manager, all the labour connected with wattle growing being done by Africans. In many parts of Africa economic development has been hindered by lack of adequate labour, but the Midlands region of Natal is fortunate in this respect. Indeed, Pietermaritzburg, already defined as the centre of the Wattle Belt, is also the centre of a "Black Belt," comprised mainly of the Zulu people. These live either in locations near the big towns or in the numerous reserves from which they can easily be drawn. True, there is always the competition of the mines. Locally there are coal mines but more important is the attraction of the gold mines on the Witwatersrand which, though distant, offer such rewards for labour that most other industries cannot compete. Wattle farmers, however, can generally meet this competition provided they treat their labourers well and, so far at least, the supply in Natal has not limited development in any way.

Labourers may be engaged by contract, as "squatters," on a daily basis, as voluntary labourers, or as casual labour. Contract labour is recruited from the reserves, the natives agreeing to work for periods of six months or more, after which they return home to the kraal to herd their animals. They are generally accommodated in compounds, consisting either of huts or barrack-like blocks of brick or concrete built for single men. Sometimes lighting is provided ; sometimes water is laid on or is available from some central point ; and sometimes boards, raised above the concrete floor, are provided for sleeping. Food is supplied by the farmer, the minimum ration being three pounds of mealies a day per person. The maize may have been grown on the farm or, where land cannot be spared for this, be bought in bulk. This latter practice is more often found on plantations owned by large companies, where the land is used solely for wattles, than when the natives are employed by private farmers, who rarely practise such absolute monoculture. Where a shortage of land operates against the production of food, intercropping has been introduced. Thus immediately a wattle plantation is clear-felled maize is planted before the wattle germinates for the next cycle and reaped whilst the trees are still in their first year. This can be done every year and a fairly steady supply maintained.

---

[8] "The Wattle Industry in South Africa." Report of British Empire Forestry Conference, S. Af., 1935.

[9] "The Silviculture of Black Wattle." S. Af. Dept. of Forestry. Bulletin No. 31, 1947, pp. 48–50.

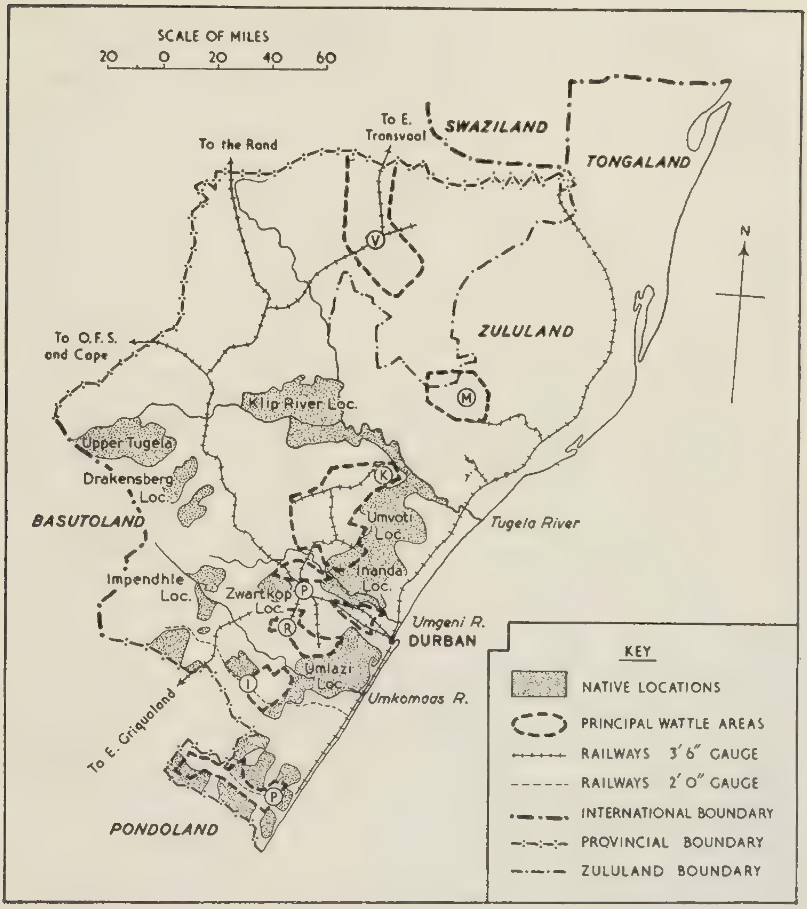


Fig. 2.—Wattle areas, native locations and communications in Natal.

" Squatters " are labourers whose homes are part of a kraal on the wattle farmer's land. They remain at the kraal even if the landowner changes and offer their labour to the newcomer. Sometimes the latter may decide to put the land to different use rather than leave Africans to farm it unscientifically. It sometimes happens under schemes for the development of waste land that a kraal and its inhabitants have to be removed altogether or, under happier circumstances, transferred to some other less valuable corner of the farm. Most private farmers prefer to have a few huts on their land in which labourers can reside permanently, and some have sufficient resident labour to make the employment of contract labour unnecessary. Certainly squatters provide an assured labour supply and, in addition, the labour of the wives and children is available.

No accommodation is provided for voluntary or casual labour, although both qualify for the minimum ration of three pounds of mealies per day and all are issued with one pair of strong boots a year for outdoor work. Voluntary labourers come to the wattle farms from neighbouring reserves or locations and, where they give good service, are induced to settle.

Whatever their conditions of service labourers are organised into gangs for daily tasks. The foreman may be an Indian or a "Coloured,"[10] but more often the Africans have their own "induna" or headman. Nearly all the work involved is manual labour, but sometimes Africans undertake the weighing of bark and checking of the amount stripped and despatched. Natives, however, are generally regarded as unskilled and need to be stimulated. Hence the system most commonly adopted by the farmers is that of task or "piece" work. Gangs are allotted a daily task. Although women are often employed for the hoeing and weeding and small boys to lead the oxen, and whilst ploughing, felling and stripping are regarded as men's tasks, a wife will sometimes help to strip a few hundred pounds of bark a day. The day's task completed, the labourer is under no obligation to work longer and, if efficient, he may thus finish by early afternoon.

Payment per task per day is usual and all tasks are rated equally save stripping, which is regarded as more skilled and valuable than any other and correspondingly more highly paid. The prevailing rate is 2s. 0d. per task or for stripping 5d. per 100 lb. and 6d. per 100 lb. after 600 lb. Some farmers, however, prefer a time system, paying labourers a monthly wage of 25s. 0d., rising to a maximum of £2. This is the average rate ; there is no standard scale and it is considered adequate to maintain the natives' customary standard of living. Those farmers who are members of the Wattle Growers' Union have a tacit understanding as to wage rates and labour conditions which ensures reasonable uniformity over the industry and eliminates possible competition between employers. As the labourers have no similar organisation it is easily understood that working conditions are purely arbitrary. Owing to the size of many of the farms transport is being more frequently provided to carry the natives to and from their work, the farmers realising that such a policy is ultimately in their own interests.

A more important concern is the transport of bark and timber. A well-planned system of haulage roads in the plantations is essential in commercial wattle culture. The roads consist of strips of cleared land, twelve to thirty feet wide, which also act as firebreaks. Care is taken in their alignment and they are usually not more than eighty yards apart so that bark and timber need be carried no more than forty. They are unpaved and deteriorate rapidly if used immediately after heavy rain ; gradients are often steep and if more than one in fifteen wear and tear on the lorries is severe.

The haulage of bundled bark to the railways, even over long distances, by motor-truck or ox-wagon presents no difficulty, the cost of transport being very small in relation to the current value of the commodity. The real transport problem arises when dealing with the

---

[10] Half-caste.

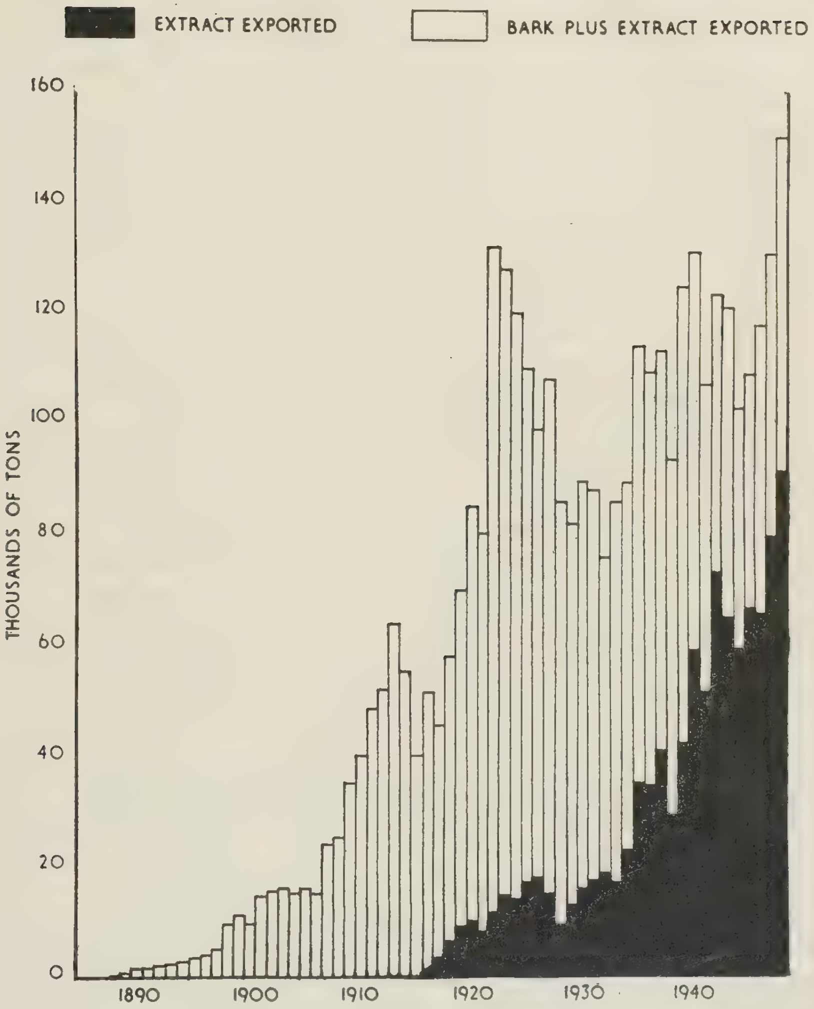


Fig. 3.—Growth of wattle exports from Natal.

marketing of the timber, the value of which is small in relation to its bulk, and it is generally found unprofitable to sell the timber if the plantation is more than nine miles from the railway. Disposal of timber has a considerable influence on the development of the wattle industry, for where it cannot be profitably utilised the full costs of cultivation and exploitation must be borne by the bark. Broadly speaking, timber is worked only in those areas accessible to Pietermaritzburg by rail or along the main line to Johannesburg, the principal market.

Railway development has thus played a great part in the expansion of the wattle industry, but there are still considerable areas in Natal highly suitable for the tree but inaccessible by rail owing, presumably, to the configuration of the land ; the Kranskop and Vryheid districts and the Karkloof Range are examples. Yet at one time the whole province was virtually inaccessible, for everywhere steep gradients have to be negotiated and every line must rank as an engineering feat. Sometimes, however, settlement is ahead of the railway, as in the Melmoth district of Zululand, already a considerable wattle area in spite of lack of rail facilities, though any further development of its potentialities in this direction are limited, the railhead being an average of fifteen miles from the plantations. This is a prohibitive distance for timber, so the stripped logs on more than 46,000 acres have to be left to rot.

In all about one-third of the wattle areas of Natal are not commercial timber-producing areas, although much has been done to find ways of utilising available supplies. In the mines wattle timber is highly suitable for uprights, wedges, packs and cribs but Stephens points out that if the price of timber should increase consumption by the mines would rapidly decline. On the farms wattle timber is used for fencing posts ; treated with creosote it will resist the attacks of the white ant indefinitely. It is used also for charcoal, but any market for this is very limited. In 1949 another use was found when a factory was opened at Estcourt in Natal for the production of " Masonite," a new kind of board made from wood fibres. This factory absorbed wattle timber at the rate of 400 tons per week and its owners envisage the development of an export trade.

Meanwhile wattle bark and extract are the only exports of the industry. Formerly bark only was exported ; now the extract provides the greater proportion of the export value. The production of tannin extract did not start until 1916 when the markets for the raw material—bark—declined, owing to wartime shipping difficulties. A factory was built at Pietermaritzburg and a few years later the Natal Tanning Extract Company was formed and in 1920 bought out the old partnership. This Company now controls 60 per cent. of the extract exported and has four factories. Three of these are in Natal, at Pietermaritzburg, Melmoth and Paddock, respectively. The fourth is at Piet Retief in the Eastern Transvaal. The first-mentioned is still the largest, having expanded its production from 300 to 2,600 tons per month, and in 1948 accounted for one-third of the total Union export. The trend of prices throughout has stimulated these developments, whilst increased difficulties in the production of quebracho in the Argentine have been an additional incentive to expand output.

To-day the wattle industry is one of the most stable in the country and ranks fourth amongst the Union's agricultural enterprises. Thus it was with confidence that the Wattle Growers' Union, with Government assistance, opened the Wattle Research Institute in Pietermaritzburg in May, 1949.

The writer wishes to acknowledge with gratitude the debt she owes to Professor A. V. Williamson in connection with her work and in particular with the preparation of this article.

Available now

MEIKLEJOHN

Bartholomew's Advanced Atlas

OF MODERN GEOGRAPHY

'It is, without any doubt, a really brilliant atlas, far ahead of anything we have up to now.' This extract from one of many unsolicited letters substantiates our claim that this is an essential atlas for the advanced Geography student and for all Geography specialists. The Second Edition of this new atlas is now ready.

Size 15x10 · 108pp Maps · 48pp Index.
STUDENTS EDITION 25/-
SPECIAL DE LUXE LIBRARY EDITION .... 35/- net.
A prospectus is available

The Comparative Atlas of Physical and Political Geography

The latest 38th Edition of this well known atlas is an entirely revised version from new plates. Now includes two-page spreads of U.S.A., Soviet Russia, the Mediterranean lands and the Far East.

Size 11x9 · 80pp Maps · 40pp Index and Dictionary of Geographical terms · BOUND IN BLUE BUCKRAM 9/-

Meiklejohn's Intermediate School Atlas

An atlas of exceptional clarity for use with 10–12 year olds. It contains a series of physical and political maps, free from all unessential detail and printed in most pleasing colours, with an index of some 3,500 names.

Size 11x9 · 40pp Maps · 8pp Index · LIMP CLOTH 3/6 CLOTH BOARDS 4/-

Geography teachers are invited to send for inspection copies.

MEIKLEJOHN & SON LTD · 15 BEDFORD STREET · LONDON · WC2

An Introduction to Economic Geography

By N. J. G. POUNDS, M.A., Ph.D.

Associate Professor of Geography, University of Indiana;
formerly Tutor at Fitzwilliam House, University of Cambridge.

THIS book for sixth forms is written on a new plan, departing from the standard lines followed by most economic geographies over the past twenty years. It provides an introduction to the subject and a background to the more detailed regional studies which it will normally accompany.

The author first outlines the broad pattern of world agriculture, the distribution of the various crops that men grow, and then considers the human and economic factors which produce such a pattern. Chapters on forestry, fisheries and mining complete the section on primary production.

The nature and distribution of manufacturing industries form the next topic, and the physical causes underlying are given full consideration. The final section of the book deals with transport and trade.

There are many clear and helpful maps and diagrams specially prepared for the book. 10*s*. 6*d*.

Europe

By W. J. H. WATKINS, M.A., B.Sc.

THIS is a textbook in geography for the General Certificate at Ordinary Level. Some chapters have been kept back until the last moment in order that the current state of affairs in a disorganised Europe may be as faithfully represented as possible, and care has been taken that in doing so the consideration given to smaller States should be adequate. A special feature of the book is the lavish scale of illustrations. 7*s*. 6*d*.

JOHN MURRAY, Albemarle St., LONDON, W.1

THE RUHR AREA: A PROBLEM IN DEFINITION

NORMAN J. G. POUNDS*

THE industrial region known as the Ruhr is the most productive and politically the most important of all the major industrial areas of Europe. It lies on the northern margin of the hill country of northwestern Germany, and derives its name from that of a river which rises within these hills and flows close to their northern margin before joining the Rhine. North of the Ruhr and parallel at least with its lower course, are the rivers Emscher and Lippe. Though industry owes its present development to the vast resources of the Ruhr coalfield, it derives from an ancient craft industry practised in the hills to the south. Small deposits of iron ore, charcoal from the forests, and water power to work the hammers and bellows, were the basis of this industry, which specialised in the manufacture of small articles of iron and steel.

This industry was not extinguished with the rise of heavy industry in the Ruhr, but developed into an important producer of quality steel, cutting and machine tools and a wide range of iron and steel goods. In much of this more southerly area the growth of the metal industry drove out an even older textile industry. The disappearance of the latter has been quite recent in some parts, but in certain towns the textile interests have been able to resist the encroachments of metallurgy and engineering. In the 18th and early 19th centuries a division gradually arose between those towns which were to become predominantly metal-working and those mainly textile. At present there is an abrupt distinction between them, not apparently related to any local resource difference (Fig. 1).

The industrial development of the northern plain did not really begin until the middle years of the 19th century, when the coking process was introduced, a century after its discovery in England, and iron ore began to be imported by way of the Rhine. Within a few years a belt of country from Duisburg and Ruhrort, on the Rhine, eastwards along the Emscher for nearly 40 miles to Dortmund, came to embrace the greater part of the Ruhr steel industry. The furnaces to the south of the Ruhr river were extinguished one by one, and this area became an iron-using rather than iron producing region, dependent on the import from the north of materials for its metallurgical industries. Only in the neighbourhood of Siegen have a few smelting furnaces remained in operation, assisted by the excellence of the manganiferous ores of this area.

This pattern, which had developed by the last quarter of the 19th century, has been intensified in succeeding years. The industrial

---

* Dr. Pounds is Associate Professor of Geography in The University of Indiana, and was formerly Tutor, Fitzwilliam House, Cambridge.

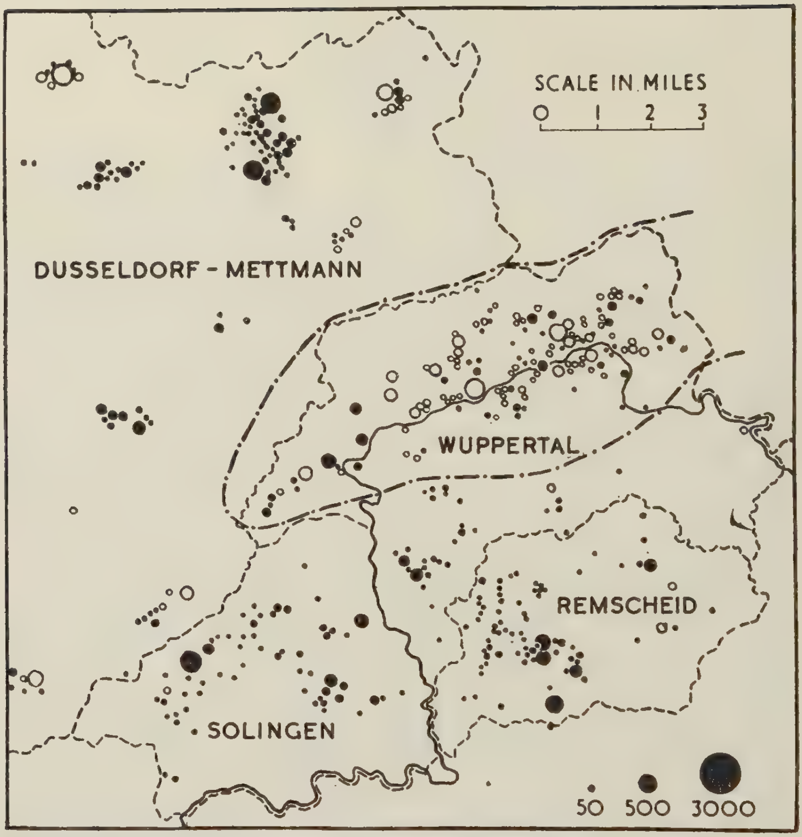


Fig. 1.—The distribution of metal working (solid black discs) and textile working (open circles) in the *Kreise* Düsseldorf–Mettmann, Wuppertal, Solingen and Remscheid.

region of *Nordrhein-Westfalen* consists today of a central core, dominated by coal mining and steel producing, with other industries, such as the chemical, which are heavily dependent on coal. To the south is a region of specialised iron using industries, characterised in general by smaller units of production. To the south, southwest and west are specialised areas of textile manufacture, notably in the Wupper valley and at Krefeld-Uerdingen, München Gladbach and Rheydt. To the south, on the river Rhine, are Düsseldorf and Köln, both with metallurgical, engineering and chemical industries. Düsseldorf is closely linked with the Ruhr, but Köln is in most respects functionally distinct from the main industrial concentration. To the north of the industrial area the coalfield dips more deeply beneath the cover of younger sedimentary rocks. Coal mining has crept north to the Lippe river, and even beyond it in parts, but heavy industry has not yet advanced beyond the watershed between the Emscher and Lippe. North of the Lippe there is little manufacturing industry beyond the small but ancient manufacture of woollen and linen cloth.

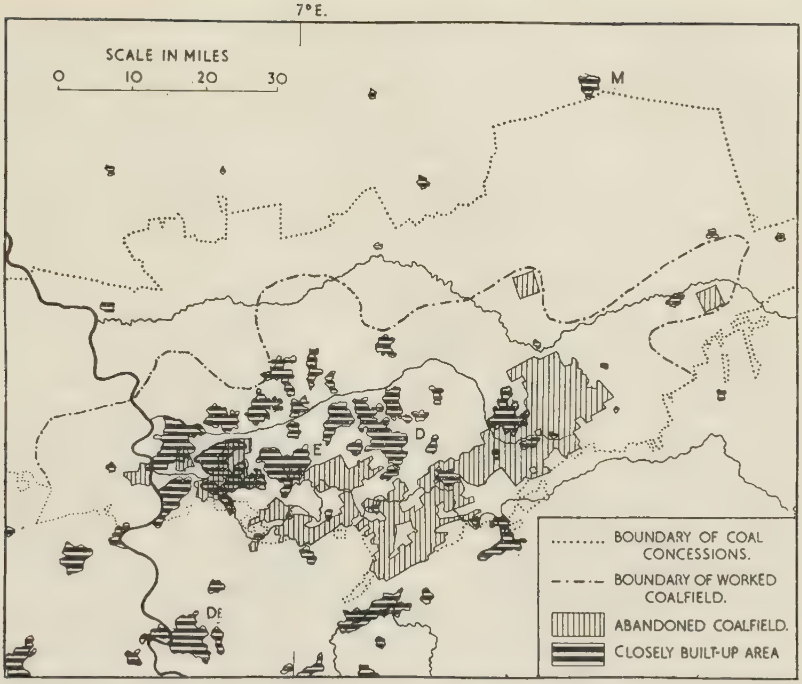


Fig. 2.—The area of the worked coalfield.

It is of interest to geographers to define more specifically and with greater precision the industrial region of the Ruhr. The geographical delimitation of the region is of the greater significance in view of the political and administrative problems which it raises. In the following pages the basis for the definition of the Ruhr is first considered, and then, against this background, the several attempts made to define the Ruhr area for administrative and political purposes are examined.

THE COALFIELD

The coalfield of the Ruhr is the chief resource base of the industries of the area, and its extent must be considered in any attempt to define the area. It lies almost wholly north of the river Ruhr. The area south of the river may be considered almost exhausted, and in fact only two sizeable mines are still operating here in 1950. The coalfield extends to the west of the Rhine, but the seams here are deep and are only mined close to the river. North of a line drawn approximately from west to east through Essen, Bochum and Dortmund, the coal measures dip beneath the cover of secondary rocks. Along the Emscher valley the upper surface of the coal measures has sunk to a depth of about 100 feet below sea level, and in the Lippe valley to about 1,000 feet. Mining has progressed northwards from the earliest workings which were in the Ruhr valley. In 1837 the first shaft was sunk through the Cretaceous cover. In 1877 after a long period of trial and experiment, the first shaft was opened in the area of the coalfield west of the Rhine.[1] At present most of the newer mines lie north of the Emscher river, and three mines have been sunk north of the Lippe. The part of the coalfield which lies north of the Emscher is becoming of greater importance. The limit set to this northward migration is, in the near future at least, chiefly one of price ; of covering in the sales of coal the cost of operating very deep mines. Coal concessions have been granted very considerably to the north of the present limits of mining (Fig. 2).

The quality of the coal varies over the coalfield. The lowermost seams, which outcrop in the Ruhr valley, are made up of anthracite and forge coal.[2] At a geologically higher horizon is coking coal which comes to the surface only in small areas of the exposed field, but is obtained chiefly from the hidden field along the Emscher valley. The gas and flame coals are of a younger geological age than the coking coal and occupy the upper horizons in the coal series. They are mined chiefly towards the north of the worked area of the coalfield. The most important sections of the coalfield industrially are those that yield coking coal and occur along the valley of the Emscher, where are most of the coking furnaces and chemical works dependent upon coal.

Most of the larger industrial centres lie on the coalfield. Düsseldorf and the textile manufacturing centres are off it, but the only metallurgical towns not closely associated with coal are Hagen, Remscheid and Solingen.

DISTRIBUTION OF INDUSTRY

The majority of the steel producing units lie in a narrow belt between the Rhine near Duisburg in the west and Dortmund in the east, with an extension to the south to include Hagen (Fig. 3). To the north, and reaching almost to the Lippe valley is a region in which coal mining and its attendant coking and by-product distillation predominate. Surrounding these two areas, in which industry is based primarily upon the local resources in coal, is a more extensive region within which manufacturing industry is spread more thinly. In general it consists of the " lighter " industries. Small, finished metal goods are produced, such as nuts and bolts, locks and keys, tools and mining equipment. Production units are generally small and specialised. They often require only a small labour force in each, and are sometimes found in otherwise rural areas. This industry is in large measure a survival from an earlier period, when industry was carried on largely on a craft basis. It is of small importance to the north and northwest of the heavily industrialised area, but is more developed to the southeast, south and southwest. The southern limits of this area are difficult to define, but south of Solingen, Remscheid and Hückeswagen and east of Hamm and Werdohl it is of much lesser size and importance.

---

[1] Hans Arlt, *Ein Jahrhundert preussischer Bergverwaltung in den Rheinland*, Festschrift aus Anlass des hundertjährigen Bestehens des Oberbergamts zu Bonn, Berlin, 1921, p. 97.

[2] Chauncey D. Harris, " The Ruhr Coal-Mining District," *Geog. Rev.*, xxxvi 1946, pp. 194–221.

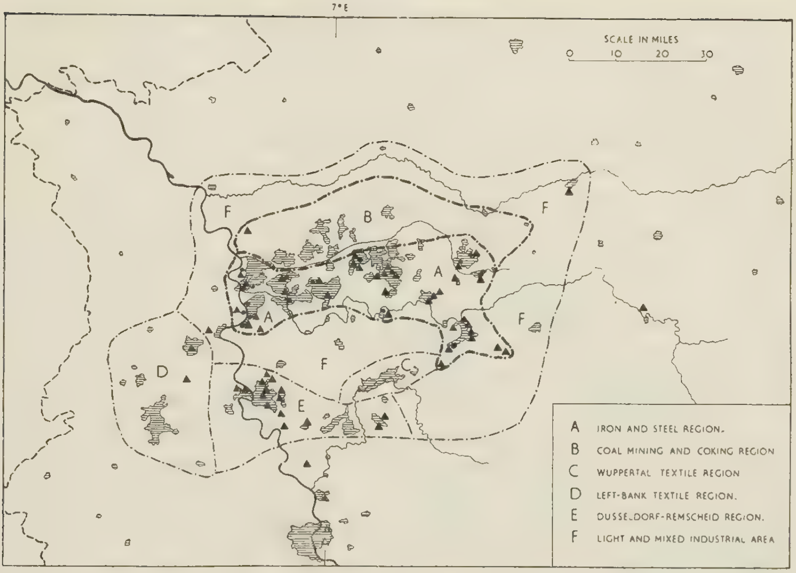

7°E
SCALE IN MILES
0 10 20 30
A
B
C
D
E
F
A IRON AND STEEL REGION.
B COAL MINING AND COKING REGION
C WUPPERTAL TEXTILE REGION
D LEFT-BANK TEXTILE REGION.
E DUSSELDORF-REMSCHEID REGION.
F LIGHT AND MIXED INDUSTRIAL AREA

Fig. 3.—Distribution of industry within the Ruhr Area.

Within this region of the "Greater Ruhr," three sub-regions of highly specialised production can be distinguished. In the southwest are a group of textile producing centres, which include Krefeld-Uerdingen, München Gladbach, Rheydt and Viersen. In the Wupper valley and on the plateau to the south is a second important textile producing area, whose focus is Wuppertal. South of the latter area and between it and the Rhine is another region in which steel-producing and steel-using industries are dominant. In and around Solingen and Remscheid are concentrated the production of knives, cutting instruments and tools. To the west, in the neighbourhood of Düsseldorf are a number of steel-producing plants, together with rolling and tube mills as well as steel-using and constructional works.

Along the Rhine are, in addition to steel production, industries based upon imported materials that are processed here rather than upon the coal and steel production of the Ruhr. These include flour milling, the processing of other foodstuffs, oil seeds and tobacco, the smelting of non-ferrous metals and the manufacture of heavy chemicals. These industries are dependent upon the transportation provided by the Rhine.

Service Areas

The cities of the industrial area are linked to one another by an interlocking system of street cars, whose tracks not only form a close network but indicate the area within which there is a vigorous movement of shoppers and commuters. The railway is the only important alternative to the street car in transportation in the Ruhr area. Trains are frequent and generally fast within the industrial area. The Ruhr cities tend in general not to be shopping and entertainment centres for the surrounding agricultural country. The long distance commutor was, at least before the bombing and destruction of many residential areas in the cities, of very small importance, and there was no great volume of movement between country and town.[3]

The street car and the Ruhr local railway service together define an area within which there is intensive movement; they are most developed and most used in the Emscher valley. Few street car services extend outside this area, but within it the network of routes is close and intensively used. The rail network is not only closer but very much more intensively used. On the north, the railroad stations of Recklinghausen and Lünen mark the limit of the intensively used railroad system: the southern limit is less clearly defined but may be set at Wuppertal and Düsseldorf.

The rural areas of *Nordrhein-Westfalen* contribute foodstuffs to the industrial area. To a small extent this dependence is reduced by the comparative "openness" of the industrial area. Considerable tracts of farm land are caught within the meshes of the industrial area, and, except in closely built urban areas, there are many small holdings planted with grain, potatoes and vegetables. The dependence for milk, meat and potatoes is mostly met on the Westphalian plain. This plain is in turn dependent on imported foodstuffs, which are, in effect, paid for by the exports of the Ruhr. Figures published in 1932 showed that less than 2 per cent. of the meat and less than 3 per cent. of the milk consumed in the industrial area is obtained from the hills to the south.[4] The latter area is on balance an importer of food. A great deal over a quarter of the meat handled in the markets of Dortmund and Essen came from the district of Münster, and the areas of Osnabrück and Minden were together only a little less important. Milk supplies were overwhelmingly from the regions of Münster and Osnabrück (Fig. 4).

The industrial area is able to supply its own needs in gas and electric power, and has an excess production which is sold outside the Ruhr area. The network of coal gas pipelines reaches northwards to beyond Münster, east to Hannover, south to Siegen and west to Aachen, and the network of electric power distribution is even more extensive.

The wholesale trading sphere of the Ruhr cities interlocks with that of neighbouring cities, so that it is almost impossible to define the area which is largely dependent upon the Ruhr. It would seem, however, on the basis of a field survey made soon after the end of the second World War that the area served by the Ruhr cities is small considering their size and importance. This may however have been due in part to the bombing during the war years and the dislocation of normal channels of trade. Field enquiry showed that the area served with wholesale groceries from the Ruhr cities extended but little beyond

---

[3] *Gesamtverkehrsplannung fur der Ruhrkohlenbezirk*, printed 1938 for the *Siedlungsverband*, but not published.

[4] H. Aubin, O. Bühler, B. Kuske, A. Schulte, *Der Raum Westfalen*, Berlin 1932, Bd III, pp. 22–25.

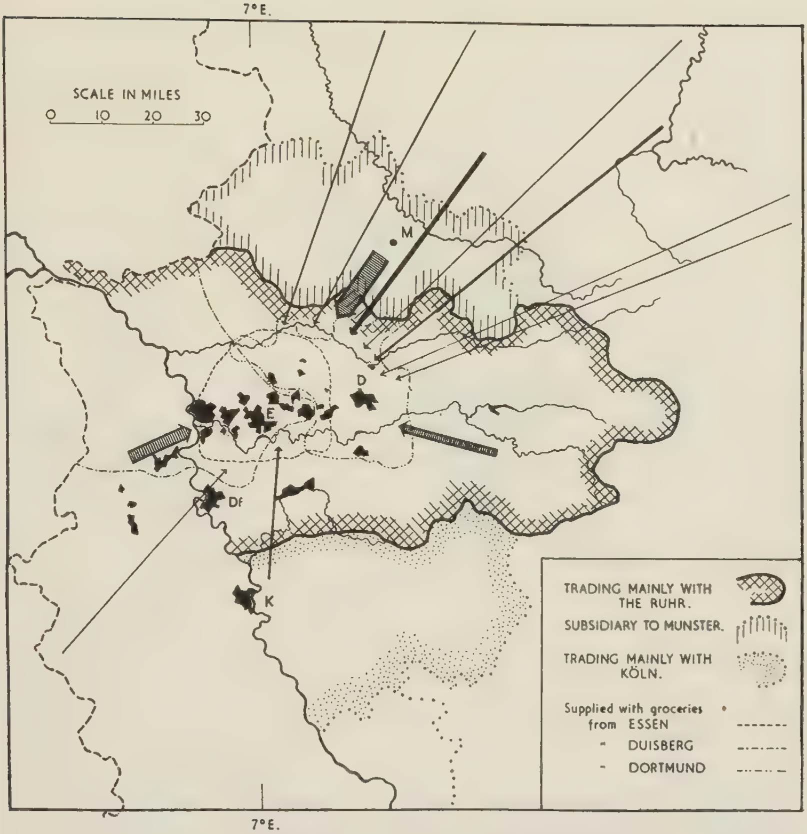

7°E.
SCALE IN MILES
0 10 20 30
M
D
E
Df
K
TRADING MAINLY WITH THE RUHR.
SUBSIDIARY TO MUNSTER.
TRADING MAINLY WITH KÖLN.
Supplied with groceries from ESSEN
" DUISBERG
" DORTMUND
7°E.

Fig. 4.—The service and supply area of the Ruhr. The arrows represent the relative importance of areas supplying milk to the Ruhr.

their limits. In certain commodities, however, the service area extended considerably further: in most however, the tendency was for the Ruhr cities to serve the northern plain, in which they competed with Münster and Osnabrück, while the hilly country to the south was served from Köln. Düsseldorf, lying close to or even inside the limits of the industrial area, serves the Ruhr area as a high class shopping centre, a centre for entertainment, and as administrative headquarters for many of the manufacturing concerns of the Ruhr. Köln is too remote to share to more than a very modest degree in these functions.

Landscape

A fourth basis of definition is the visible appearance of the country. The areas of the larger cities are closely built. Around and between them are areas which are partially built up, but where agriculture is of some significance, though holdings are small. The roads are lined with cottages and shops and there are small industrial works and mines. It is an untidy landscape, where industry is slowly replacing agriculture. In a third type of landscape agriculture is dominant, with mining and industry subsidiary in the visible landscape. Settlements are mainly

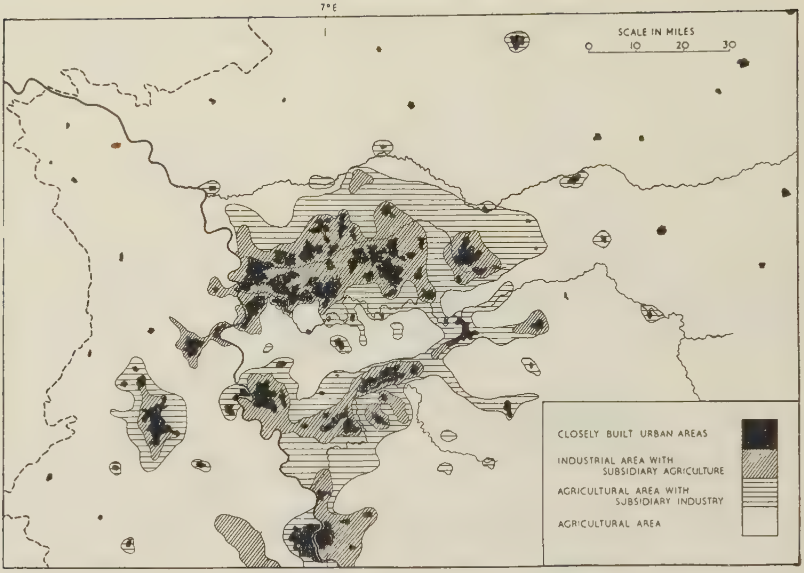

7°E
SCALE IN MILES
0 10 20 30
CLOSELY BUILT URBAN AREAS
INDUSTRIAL AREA WITH SUBSIDIARY AGRICULTURE
AGRICULTURAL AREA WITH SUBSIDIARY INDUSTRY
AGRICULTURAL AREA

Fig. 5.—Landscape types in the Ruhr Area.

small farms and the cottages of agricultural labourers, with a number, which is increasing on the north, of mining and industrial settlements. In a last category is the wholly agricultural countryside, in which human activities are not in general directly related to manufacturing industry.

The map (Fig. 5) has been constructed of these landscape types on the basis of a field examination, but the classification is in some measure a subjective one, particularly the division between the predominantly industrial and the predominantly agricultural areas.[5]

Definition of the Ruhr

Several attempts have been made in recent years to define the Ruhr area. Each is of necessity arbitrary. The *U.S. Department of Commerce* draws a smooth curve to include, in the east, the districts of Hamm and Iserlohn ; in the south, Remscheid and Grevenbroich, and on the west the textile producing area west of the Rhine. Its northern limit follows the course of the Lippe, and includes all except one of the existing coal mines (Fig. 6).

The French *Institut National de la Statistique et des Études économiques* shows rather greater finesse in drawing its boundary but differs from the American only in a greater northward extension beyond the Lippe and an extension on the west to the Dutch frontier (Fig. 6). There is agreement that the Ruhr area should be taken to include both the textile producing area to the west of the Rhine and also the light engineering and textile area to the south of the river

---

[5] A similar basis was used in the map published in 1950 for the *Nordrhein-Westfalen Landesplanungsbehörde* by August Bagel, Düsseldorf, but the subjective element appears to have been particularly strong in the definition of the regional boundaries.

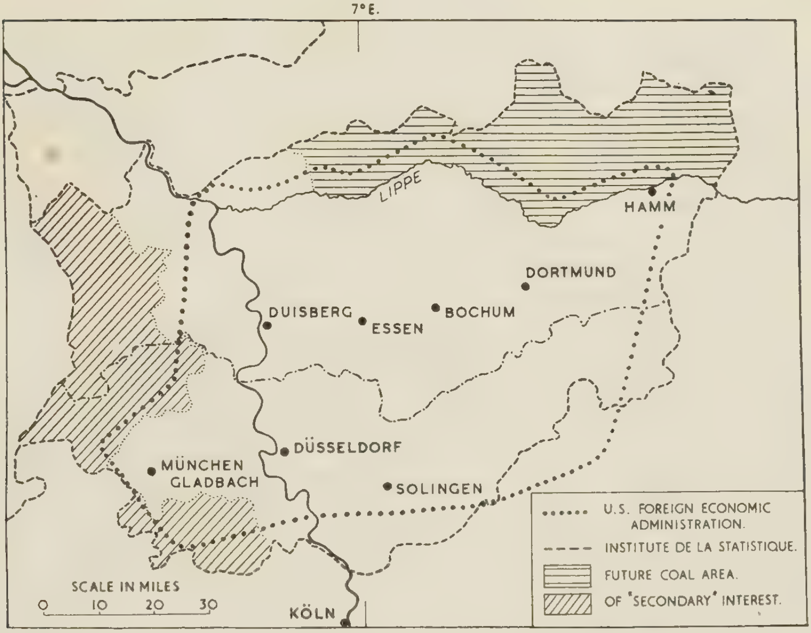


Fig. 6.—The Ruhr area as defined by the U.S. State Department and by the *Institut National de la statistique* of France.

Ruhr. The French study divides the area which it delimits into a northern zone, engaged mainly in the heavy industries, and a southern zone of lighter and textile industries.

A German study, *Der Raum Westfalen*, makes no attempt at precision, merely defining by smooth lines a region of heavy industry and the Berg-Mark region of light industry.[6]

The writer would define the Ruhr in the way illustrated in Fig. 3. This is similar to both the French and the State Department's maps, though the subregions shown differ in detail from those previously suggested.

Political and Administrative Divisions

We turn from the academic problem of defining the industrial region of Nordrhein-Westfalen to the political and administrative problem. The Germans have never recognised the area as a unit for internal administrative purposes. The region was divided before the second World War into the two provinces of Rheinland and Westfalen, which were, so far as the industrial area was concerned, further divided into the *Regierungsbezirke* of Düsseldorf and of Arnsberg and Münster respectively. These three latter divisions meet in the heart of the industrial Ruhr between Essen and Gelsenkirchen.

Within the *Regierungsbezirke* the chief administrative division is the *Kreis*, the *Stadtkreis* in urban areas and the *Landkreis* in rural. The *Stadtkreise* in the heart of the Ruhr are relatively small in area, but the

---

[6] H. Aubin, O. Bühler, B. Kuske and A. Schulte, *op. cit.*, p. 152.

Landkreise are larger. It is desirable that any attempts made to define the Ruhr for administrative purposes should recognise and follow *Kreis* boundaries because of the strength of the governmental and economic functions that are centred in the *Kreis* town. The latter is often the market and business focus for its *Kreis*, and it has been pointed out that *Kreis* boundaries frequently (about 50 per cent. of them) coincide with retail trade area divides.

A degree of administrative unity has been imposed on the Ruhr area for purposes of river control and water conservation and of regional planning and land use.

(i) *Wasserverband* : The problem of water supply for domestic and industrial purposes and the need to prevent the pollution of rivers had become serious by the early years of the present century, and was further complicated by subsidence in the mining areas of the Emscher valley, which made natural land drainage impossible. The river Ruhr is the most valuable source of water supply, and several of its tributary valleys, lying in the hills of the Sauerland, have been dammed for water conservation. Twelve dams have been built on the Ruhr and its tributaries, and in 1913 the *Ruhrverband* was created to handle the problem of maintaining the dams, rationing the water amongst the several users and checking pollution along the river.[7]

The greatest use of water is in the Emscher valley, the smallest catchment area in the region and the least fitted to supply it. Ruhr water is piped over the divide into the upper part of the Emscher valley (Fig. 7), and after circulating through the domestic and industrial channels, is fed into the Emscher, only to be purified at the *Klaranlage* for re-use, until it is eventually passed into the Rhine. The Rhine-Herne Canal, which parallels the Emscher for much of its course, together with the Lippe Seitenkanal and at least the southern part of the Dortmund-Ems Canal depend largely on the river Lippe for the supply of water to maintain a level for navigation. The *Emschergenossenschaft* was formed in 1914 to control water use and carry through land drainage in the Emscher valley. Lastly, the *Lippeverband* was established in 1926 to fulfil the same functions in the Lippe valley, then beginning to be opened up for mining and industrial development.[8] Fig. 7 shows the division of territorial responsibility between the three authorities, whose boundaries are in effect the divides between the three rivers, except that the upper courses of the Lippe and Ruhr lay outside their jurisdictions.

The Wupper valley and the " Left Bank " each have small water control authorities, but in these the problems are less important and less urgent. The *Entwasserungsgenossenschaft Moers*, the Left Bank authority, is primarily engaged in land drainage in the polderland to the west of the Rhine. The *Wasserwirtschaft in rheinisch-westfälischen Industriebezirk G.m.b.H.* exists to secure agreement between the several

---

[7] A. Heinrichsbauer, *Das Wasserwirtschaft im rheinisch-westfälischen Industriegebiet*, Essen, 1936.

[8] H. Helbing, " Zur Gründung einen Lippegenossenschaft " *Glückauf*, lxii, 1926, pp. 323–330.

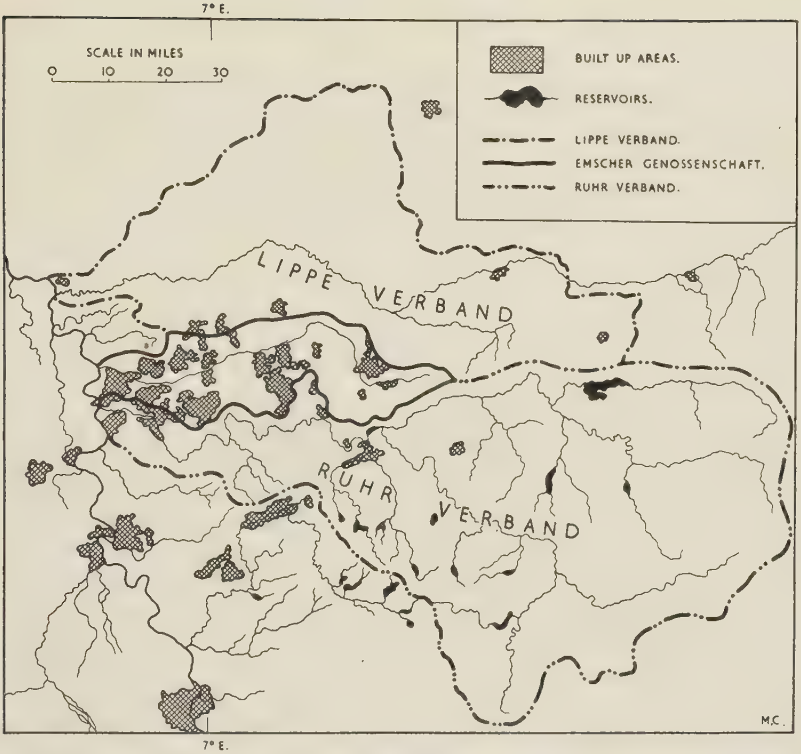


Fig. 7.—Territories controlled by the Water Control Authorities (Wasserverbände) in the Ruhr area.

authorities concerned with water supply and river regulation, and may be said to bring some administrative unity to the drainage basins of the five rivers.

(ii) *Siedlungsverband*: In 1920 a more integrated and extensive control over the industrial area was created by act of the Prussian Government with the establishment of the *Siedlungsverband Ruhrkohlenbezirk.* Its purpose was to control land use, to allocate land for housing and industrial development, to preserve open spaces for recreation and agriculture and to authorise the construction of roads, canals and public and private railroads. Proposed developments are required to be registered with the *Siedlungsverband* and its permission obtained. In fact, however, local offices in the more important *Kreise* of the Ruhr area have powers delegated to them, which they exercise under the authority of the central office of the *Siedlungsverband* in Essen. The authority of the latter extends over the whole of the central industrialised area from the Rhine eastwards to Dortmund. The *Verband* was formed too early to have included within its sphere of operation the most recently developed area of the coalfield in the Lippe valley. It excludes also the *Kreis* Iserlohn in the southeast and *Kreis* Düsseldorf-Mettmann, south of Essen, in both of which are many iron using industries, and also the whole of the Wuppertal and Left Bank textile producing areas. It does, however, extend west to the Dutch frontier.

When, in 1936, planning districts were established for the whole Reich, the limits of the Ruhr Planning Authority were preserved, and the planning regions of Westfalen and Rhineland were erected to enclose it.[9] The area subject to the Rheinland *Landesplanungsbehörde* in Düsseldorf is thus split into two parts by the westward extension of the Ruhr *Siedlungsverband* up to the Netherlands frontier, not without serious inconvenience in planning the development of the area. It is not without interest that the basic study of the Rheinland province made for planning purposes is of the historic Rheinland province, including those parts of it which are controlled by the Ruhr *Siedlungsverband*.[10]

(iii) *French Occupation of the Ruhr*, 1921–1924: By the terms of the Armistice of November 11th, 1918, confirmed by Articles 428–432 of the Treaty of Versailles of June 28th, 1919, the Allied powers, Great Britain, France and Belgium, were required to undertake the occupation and garrisoning of that part of Germany which lies west of the Rhine, together with certain "bridgeheads" on the east bank. The French had favoured a more drastic policy, and cherished the dream of separating the whole Rhineland from Germany and of erecting it into a separate state, with or without the inclusion of the Ruhr area. They were therefore not slow in seizing the opportunity to occupy the Ruhr industrial area, which lay outside the zones of occupation prescribed by the peace treaty. On March 8th, 1921, French forces occupied the right bank cities of Duisburg, Ruhrort and Düsseldorf in consequence of German non-payment of a Reparations contribution. This was followed on January 11th, 1923, by the occupation of the central area of the Ruhr itself, including Essen, and on January 15th of the area extending eastwards to Dortmund,[11] and other areas were occupied at later dates. The French occupation of the Ruhr, which was faced throughout by the passive opposition of the German population, ended with the withdrawal of the last French troops in August, 1925.

The area occupied by the French was limited on the north by the river Lippe and the south approximately by the divide between the Ruhr and Wupper rivers. The Wuppertal textile area was not included within the area of French occupation, but south of Wuppertal the occupied territory extended across the river Wupper to include Solingen and Remscheid. The French and the Belgians, who occupied a small area in the northwest, appear to have been interested primarily in occupying the mining area in order to enforce deliveries of coal, and secondly in controlling the steel industry (Fig. 8).

---

[9] Robert E. Dickinson, *The Regions of Germany*, London, 1945, pp. 18–19.

[10] Grundlagen der Landesplanung Nordrhein-Westfalen, Heft 8 of *Schriftenreihe des Ministerpräsidenten des Landes Nordrhein-Westfalen-Landesplanungsbehörde*, Düsseldorf, 1947.

[11] A. J. Toynbee, *Survey of International Affairs*, 1920–1923, Oxford, 1925, pp. 101–103. See also daily reports in *The Times* (London) from January 12th, 1923, onwards, and Hans Spethmann, *Zwylf Jahre Ruhrbergbau*, Bd. iv, Berlin, 1930, p. 64 for a map of French occupied posts. The whole volume is useful.

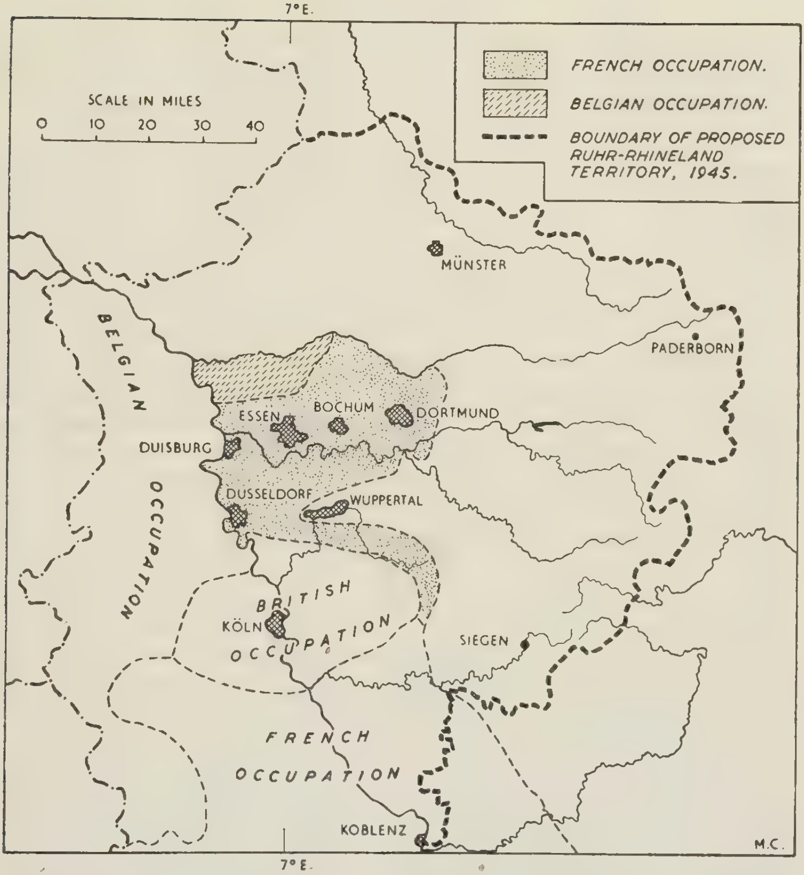


Fig. 8.—Areas of the Ruhr occupied under French leadership 1921–24, and the boundary (which follows existing *Kreis* boundaries) of the proposed Ruhr-Rhineland territory, 1945.

(iv) *Projected Separation of the Ruhr Area*, 1945 : The separation of the Ruhr area seemed in 1945 to " afford the most important single opportunity permanently to reduce the war-making power of Germany."[12] Much thought was given to the project, and the " service " area of the Ruhr cities was carefully studied, together with the dependence of the Ruhr area on outside sources of foodstuffs, water and power.[13] The projected separation of the Ruhr area was not pursued, despite the strong support given it by the French. The American report appears to have underrated the difficulties in the way of such a project, though it did contemplate the formation of a unit a great deal larger than the industrial area. Tentative boundaries were suggested. These included the whole area to the west of the Rhine together with an area east of the river which was bounded on the north by the middle Ems valley and the Teutoburger Wald and on the east and southeast by the high and sparsely peopled Rothaar Gebirge and Westerwald (Fig. 8). The projected state included the valleys of the Lippe, Emscher and Ruhr as well as of the Wupper and Sieg. In drawing its boundaries an attempt was clearly made to follow a region of sparse population, at the expense of including within the proposed state districts which had but little connection with the industrialised area.

---

[12] *Separation from Germany of the Ruhr-Rhineland Territory*, T.I.D.C. Project 22, U.S. Foreign Economic Administration, Oct., 1945.

[13] *The Ruhr: Problems of Boundary Delimitation*, Department of State Interim Research and Intelligence Service: Research and Analysis Branch, Confidential Report, mimeographed, 11th Dec., 1945.

Such a frontier included not only the areas serviced by the Ruhr cities, but also the greater part of the area which supplied vegetable foodstuffs and milk to the Ruhr. It also included the drainage basins of the Ruhr rivers, thus ensuring water supply to the industrial area, and most of the areas dependent upon the Ruhr for the supply of gas and electric power. It is possible that the commission was over-concerned with the minutiae of milk supply and not ready enough to recognise that the greater part of Germany depended upon the Ruhr for the supply of coal, steel goods and mechanical equipment.

(v) *Ruhr Authority*: The establishment of the Ruhr authority, which was announced in December, 1948, was in some ways an alternative to the creation of a separate political unit to include the Ruhr area. Its functions however, fell very far short of political control of the area. They were limited to supervision of the German coal, iron and steel industries, the apportionment of these commodities for domestic consumption and for export, and the prevention of any new concentration of economic power in the hands of the German industrialists.[14] The area subject to its control appears to have been determined by the twofold object of including all the productive coal-field and the steel producing plant. On the south it embraced the steel producing and metallurgical centres of Neuss, Düsseldorf, Solingen, Remscheid and Iserlohn. It excludes the "left bank" textile area and might also have excluded the textile centres of Wuppertal, if these had not in turn been enclosed within the steel producing areas of Remscheid, Solingen and Düsseldorf. The limits of the Ruhr Authority's jurisdiction were adjusted to the *Kreis* boundaries.

CONCLUSION

It is impossible to conceive of a Europe in which the Ruhr area will not be of great economic, and thus of great political importance. Its control has been a matter of great moment to France and also to other European states for over a generation. A problem of the post-war years has been to limit Germany's power to make war by reducing and controlling the industrial capacity of the Ruhr. It is possible that this problem may yield place to another, that of the controlled development of the Ruhr industries in the interests of west European defence. In any event, the policies of the western powers towards Germany are likely to be strongly influenced by Germany's industrial capacity, and in the formulation of those policies the definition of and control over the Ruhr is not likely to be of merely secondary importance.

---

[14] *The Times*, London, December 29th, 1948.

GEOGRAPHY IN THE DISSENTING ACADEMIES

HARRY ROBINSON*

IN the development of geographical education two points, as Foster-Watson said[1], should be noted : firstly, that it took place outside the grammar schools and owed its advancement in the main to the private schools, and secondly, that the subject of geography arose out of the strangely mixed but fascinating study of cosmography, emerging only slowly as an independent discipline.

Education during the Middle Ages was intimately linked with the Church and it was natural that the Church should control the schools and what was taught in them. The curriculum was, therefore, geared to the demands and needs of the Church and this amounted to precious little beyond Latin, the language of the Schoolmen and the lingua franca, as it were, of Christendom. With the Renaissance " new learning," in contradistinction to medieval scholastic learning, appeared and inaugurated the classical tradition. " Classicism," the study of antique languages and literature, became the vogue. But beyond a shift of emphasis from the Latin language to Latin literature and the addition of Greek there was little fundamental change in the school curriculum. John Brinsley, a schoolmaster, in his *Ludus Literarius* (1612), describes a typical grammar school of his day and shows that the chief study was Latin and that even the other classical subjects, i.e., Greek, Hebrew and Divinity were of but secondary importance[2]. The purpose of the grammar school was, essentially, to provide pupils with the necessary linguistic ability to read the classical authors and understand the scriptures. This was fundamental but it was also sufficient and other subjects were deemed to be quite unnecessary. William Dampier, for instance, had to leave the grammar school and go to a private tutor in order to learn the rudiments of arithmetic to fit him for his career at sea[3] ! Just as the grammar schools were traditionally, one might say almost exclusively, literary and classical, so too were the universities dominated by the classico-religious tradition. The enthusiasm for classical studies had the unfortunate effect of discouraging interest in the subjects of the medieval quadrivium. Although the Renaissance had led to a reformulation of the idea of a liberal education humanism became divorced from its original aim and a narrow humanistic education developed[4]. Classical studies from a means came to be an end in themselves.

---

* Mr. Harry Robinson is lecturer in Geography at Huddersfield Technical College. He has contributed to earlier volumes of *Geography*, in the articles " The Influence of Geographical Factors upon the Fine Arts," vol. 34, 1949, pp. 18–29, and " The Evolution of the Ship in relation to its Geographical Background," vol. 24, 1939, pp. 95–109.

[1] Watson, F., " History of the Teaching of Geography," in *Cyclopedia of Education*, ed. Munroe, vol. iii, London, 1911, p. 26.

[2] Adamson, J. W., *A Short History of Education*, London, 1919, p. 60.

[3] Taylor, E. G. R. " The Early Navigator," *Geogr. Journ.*, 1949, p. 61.

Although the Renaissance harnessed the grammar schools and universities with the classical tradition it would be misleading to suggest that there was never a departure from the straight-jacket of classicism. Slight and sporadic though it may be there is evidence that other things beyond the classics were occasionally taught and learned and it is reasonable to assume that a certain amount of miscellaneous information must have been imparted, consciously or unconsciously, as a by-product of the work in classical studies. The amount of this strictly non-curricular knowledge received by the pupils depended upon the teacher. But any new subjects which might have been introduced were fortuitous and ephemeral, depending upon the interests and enthusiasm of the tutor and were dropped when he was removed. Geography, for instance, found no place as an independent study in the curriculum : it was merely part of the erudition necessary for the elucidation and understanding of classical texts[5]. Thus as a result of the twin controls of Authority and Tradition the organization, curriculum and method of the grammar schools and universities followed fairly rigid lines and for developments in educational theory and practice one must look elsewhere. Educational experiment and progress during the 17th and 18th centuries focuses upon the Academies.

During the 17th century an alternative tradition to the classical emerged in education. The new tradition resulted chiefly from two forces : first, the demand of the titled and merchant classes for a more practical and liberal education and, second, the ideas and writings of Renaissance educationists and thinkers, e.g., Vives, Elyot, Humfrey, Cleland, Ramus, etc. These were the progressive forces, the one begetting, the other directing, educational reform. It was with this alternative tradition to the classical that the Academies, both Courtly and Dissenting, associated themselves. Whereas the Courtly Academies made little headway in this country, the Dissenting Academies flourished. The latter, though never at any time large or numerous, became singularly important, outstripping the schools and universities in efficiency and influence and effectively breaking the educational monopoly of the conservative and decadent universities and schools. Not merely did the Dissenting Academies break away from the old classical-bound tradition but, more important, they began a new one. Alive to contemporary needs the Academies provided a realistic and utilitarian education and the teaching of "modern" subjects was both advocated and undertaken by the Dissenters[6]. Amongst these " new " subjects was geography.

Details of many of the Academies are lacking and in some cases nothing but their names, casually referred to in Nonconformist histories, exist. The contents of some of the lectures given or notes of lectures have, very fortunately, been preserved and these, in addition to the textbooks used by the students which largely formed the basis of the instruction given, help to shed some light upon the courses of study, methods of teaching and students' work in the Academies. When it comes to geography, however, it is unfortunate that there is scarcely a single extant copy of lectures, published or unpublished, providing us with accurate information of the content and type of geography taught in the Academies. There is no doubting the fact that geography increasingly became recognized as a subject of the curriculum and made advances under Dissenting tuition, but geography, like history, was, on the whole, neglected in comparison with such subjects as the sciences. The following figures give some indication of the growing recognition of geography in the Academies. Of the seventeen known first period Academies (1662–1691) there is specific reference to geography being taught in three of them ; during the second period (1691–1750) seven at least out of thirty-five taught geography and in the third period (1750–c. 1800) eleven out of twenty-three[7].

---

[4] Munroe, P., *Textbook in the History of Education*, 1910, p. 369.

[5] Barnard, H. C., *Principles and Practice of Geography Teaching*, London, 1933, p. 2.

[6] Parker, I., *Dissenting Academies in England*, London, 1914, p. 1.

In the early Academies classics still had pride of place but they did not monopolize the curriculum entirely and other subjects often found a place. For example, the Academy at Sherrifhales in Shropshire, started by the Rev. John Woodhouse and which flourished between 1663 and 1697, included within its course work in mathematics, natural science, anatomy, history and geography. At Sherrifhales "Practical exercises accompanied the course of lectures and students were employed at times in surveying land, composing almanacs, making sundials of different constructions and dissecting animals[8]." Amongst the authors chiefly studied at Sherrifhales is listed Echard's *Compendium of Geography.* Typically in these early Academies there were no set lectures in geography : such geography as was learned was gained from books recommended to the students who read them privately[9]. Questions upon the subject matter of the books were put to the students and the tutors supplied some commentary and elucidation. The possibilities of the early Academies were restricted in so far as they were small private schools with, normally, only one tutor and denied security of tenure.

The Academies of the second period (1691–1750) provide more information about geography. During this period specialist teachers appeared, the vernacular became increasingly used and geography became more widely studied. The Academy which exercised the greatest influence at this time was that at Northampton. Originally founded in 1715 by the Rev. John Jennings at Kibworth, it reached the peak of its importance under the Rev. Philip Doddridge, D.D. who, as a youth, had been educated at Kibworth. It is from Doddridge's writings that one learns what the Academy was like and how it was run ; he wrote : " Our course at Kibworth was the employment of four years and every half year we entered upon a new set of studies or at least changed the time and order of our lectures." The first half-year's work was " Geometry and Algebra three times a week, Hebrew twice, Geography, French, Latin prose authors and classical exercises once a week." It will be noted that classical studies loom less large than formerly and that a lecture period was given to geography but " The lecture was only an examination of the account we could give of the most remarkable passages " of Gordon's *Geography*[10]. Geography was also included in the curriculum at Bethnal Green, Hoxton, Tewkesbury, the Second Newington Green Academy, and, in its later days, at the Bristol Baptist Academy. An extract from a letter written by Samuel Palmer (circa 1698) in defence of the Dissenting Academies, indicates that at Bethnal Green geography amongst other subjects was studied ; " In Geography we read Dionysii Periaegesis compared with Cluverius ed. Bunonis, which at this Lecture always lays upon the Table." Another extract runs : " t'was expected that the Sacred Geography and Chronology should be peculiarly observ'd and answer'd too at Demand, of which I never knew my Tutor sparing[11]." Geography was one of the subjects of instruction at Hoxton ; in a manuscript, dated 3rd Feb., 1743, in New College, James Densham, who was a master at Hoxton Academy, says " I have lectured this year to one class or another in Logic, Geography . . .[12] " Daniel Defoe, who was educated at the Second Newington Green Academy, claimed in one of his Reviews that he " had been master of five languages and had studied the mathematics, natural philosophy, logic, geography and history[13]." Defoe's "Robinson Crusoe" presupposes a considerable knowledge of geography much of which he probably gained at Newington Green. At Tewkesbury Academy, Thomas Secker, later Archbishop of Canterbury, was a student and in a letter to Isaac Watts, written in 1711, he mentions " on Wednesdays, in the morning, we read Dionysius's ' Perigesis,' on which we have notes, mostly geographical, but with some criticism intermixed[14]." From a diary kept by John Collett Ryland giving a brief account of studies for a year (1743–4) it is learned that one of the tutors at Bristol Academy, a certain Foskett, lectured on geography and used Gordon's *Geography* as his source book[15]. The above practically exhaust the references to the teaching of geography in the seminaries of the second period but one cannot assume that lack of reference implies geography was not taught ; on the other hand it is unwise to claim more than evidence supports.

---

[7] The Academies are grouped according to their type of government and the degree of support they received.

[8] Quoted in Parker, op. cit., p. 71.

[9] Parker, op. cit., p. 74.

In the third period Academies there is definite mention of the teaching of geography at the Blackburn, Bristol Baptist, Carmarthen, Daventry, Third Exeter, Gosport, Idle, Manchester, Rotherham and Warrington Academies and at Hackney College. At Idle Academy, near Bradford, students took a course in geography " for a part of the year[16] ". At Rotherham Academy, the superintendent, the Rev. E. Williams, gave lectures in geography and in one of his reports (1798) mention is made of " lectures on the use of the globes with the principle of geography and astronomy[17] ". The Rev. J. Bretland, tutor at the Third Exeter Academy, was responsible for " Geography, the Use of the Globes, Geometry, Algebra and other branches of Mathematics[18] ". At Hackney College Dr. Kippis lectured on "Ancient Geography" whilst a colleague took " Modern Geography [19] ". The elements of geography were apparently included in the curriculum of Bristol Baptist Academy according to a reference made in 1813 by a certain Mr. Exley, sometime external tutor[20]. One learns also that in 1812 an old student of Carmarthen, " Mr. Bowen of Walsal " invented " an instrument for the construction of maps " and that the Fund purchased it for the sum of five guineas for the Academy ; this suggests that geography had some place in the Academy's studies[21]. Ralph Harrison taught geography at Manchester Academy and it is interesting to note that he published *An Introduction to the Study of Geography* which contained a set of blank maps—a book claimed to be " the first initiatory work to which a blank atlas without references was attached[22]."

---

[10] Quoted from *Correspondence and Diary of Philip Doddridge*, ed. Humphreys, S. D., vol. ii, 1831–2, p. 462.

[11] Quoted from *History of Dissenters*, Bogue, D. and Bennet, J., vol. iii, London, 1812, p. 82.

[12] *Transactions Congregational Historical Society*, vol. iii, p. 31.

[13] Wilson, W., *Memoirs of Daniel de Foe*, vol. i, 1830, p. 23.

[14] Quoted in Parker, op. cit., p. 78.

[15] McLachlan, H., *English Education under the Test Acts*, Manchester, c1931, p. 92.

At Warrington, one of the most famous of the later Academies, a course in geography was included for lay students. " One or two lectures " were given each week throughout the entire course in which " the principal problems upon the Globes will be resolved ; the use of Maps represented ; and the Natural History, Manufactures, Traffick, Coins, Religion, Government, etc. of the Several Countries will be enlarged upon[23]." The teaching of geography at Warrington and elsewhere owes much to Joseph Priestley who was a tutor at the Academy from 1761–67. Priestley believed young men should be educated for life, " it is certainly our wisdom to contrive that the studies of youth should tend to fit them for the business of manhood." To this end he was a pioneer in the teaching of history, politics, economics and geography. He persistently voiced the value of geography and advocated the teaching of it. " Do not fail " he wrote, " to teach geography along with the classics, for by this means your pupils will, indirectly, acquire much real knowledge. I had a little school library, consisting chiefly of books of natural and civil history, with books of travel which I made them read (as a favour) with the map before them[24]." The following extract from Priestley's syllabus on history gives his suggestions for the study of geography : " Together with the study of history, I would advise that more attention be given to geography than I believe is generally given to it ; particularly to . . . commercial geography, exhibiting the state of the world with respect to commerce, pointing out the most advantageous situations for carrying it on ; and more especially noting those articles in the Natural History of countries which are, or may be, the proper subjects of commerce. This branch of knowledge is as yet very much confined. We are probably strangers to some of the most useful productions of the earth on which we live, but a general attention once excited to the subject by teaching it to youth in all places of liberal education would be the best provision for extending it . . . a knowledge of chemistry is absolutely necessary to the extension of this useful branch of science[25]." Priestley was obviously alive to the utilitarian value of geography and appreciated also its cultural and interest value. The interest which was stimulated at Warrington is reflected in the 82 books on history, chronology, geography, voyages and travels which are listed in the Library Catalogue printed in 1775.

---

[16] *Ibid.*, p. 196.
[17] *Ibid.*, p. 212.
[18] *Ibid.*, p. 99.
[19] *Ibid.*, p. 203.
[20] *Ibid.*, p. 99.
[21] *Ibid.*, p. 61.
[22] Harrison, R., *Sermons on Various Important Subjects*, 1813, p. 5.
[23] McLachlan, op. cit., p. 211.

From odd comments, notes and book lists it is possible to draw certain conclusions about the geography taught and learned in these non-conforming seminaries. An interesting sidelight on geography is provided by Timothy Kenrick who went to Daventry Academy in 1774 and, in a letter to his uncle, wrote : " Geography is one of the studies of this year, and it is to me one of the most agreeable. Acquainting ourselves with the different manners and customs of the different nations of the Earth, with the produce, curiosities and history of the various kingdoms of the World, make it very pleasing, and in some respects a very useful study[26]." More information is provided by a volume of shorthand notes of lectures by Dr. George Walker, tutor in mathematics at Warrington 1772–74, and, later, Principal of Manchester New College. His notes are divided into six sections, viz. meteorology, hydrography, geology, mineralogy, botany and zoology[27]." His geography was obviously heavily weighted on the physical side : human geography, even Priestley's commercial geography, found no place but this probably was hardly to be expected from a mathematician.

The text and reading books used provide a clue to geographical education in the Academies. In the earlier Academies amongst the chief texts used appear to have been the classical geographies of Pomponius Mela, *De Situ Orbis*, and Dionysius' *Periqetes*, Ferrarius' *Lexicon Geographicum*, Cluverius' *Introduction to Universal Geography* and *Echard's Geography*. Echard was a careful compiler and his book on geography, which was probably fairly typical of textbooks, was a popular work running through eight editions ; its full title "A Most Compleat Compendium of Geography, General and Special ; describing all the Empires, Kingdoms and Dominions in the Whole World" gives some indication of its content. A point worthy of note is that Carpenter's *Geography* is less in evidence than one would expect. Such books though often containing regional descriptive geography were more important for their sections on "ancient geography" and astronomical geography. Later texts included Gordon's popular *Geography*, Heylyn's *Cosmographie*, Jennings' *An Introduction to the Use of the Globes and Orrery*, Isaac Watts' treatise on mathematical geography and Varenius' famous *Geographia Universalis*, although the latter appears rather to have been used as a library reference book than a textbook[28]. In the later Academies many of the tutors wrote their own geographical textbooks, e.g. Stephen Addington, Ralph Harrison. In some Academies books of voyages, travels and the like became popular additions to the library and in the Warrington library, for example, were Purchas' *Pilgrims*, Philip's *Account of the Malabas*, Le Bruyn's *Travels*, Gage's *Survey of the West Indies*, Burnet's *Travels Through the Low Countries* and *Travels Through Germany, Italy and France*, Harris' *Voyages and Travels* and Stowe's *Survey of London.* The textbooks of geography in the 18th century were, scarcely without exception, compendious works of general geography. Such books invariably opened with a section on astronomical and mathematical geography and "the use of the globes" ; for the rest they were discursive expositions of classical geography or surveys of the contemporary political pattern crammed with lists of mountains, cities, ports, products, manners, customs and curiosities.

---

[24] *Life and Correspondence of Joseph Priestley*, ed. J. T. Rutt, vol. i, 1831-2 p. 64.

[25] Quoted in Parker, *op. cit.*, pp. 162–3.

[26] Quoted from *Transactions Unitarian Hist. Soc.*, vol. iii, p. 256.

[27] McLachlan, op. cit., p. 295.

The geography which was taught in the seminaries was chiefly astronomical, physical and chorographical in character. It was concerned with the matter and form of the terrestrial globe ; the size and measurement of the sphere ; the movements of the earth ; latitude and longitude ; the zones and climates of the earth ; the divisions of land and water ; definitions of continents, islands, etc. ; the movements of the oceans ; the location and characteristics of seas, lakes and rivers ; and on the human side with accounts of the positions, governments, cities and commodities of countries and the habitations, manners, customs and religions of peoples. In sum, geography was almost purely informational and nominational in character and consisted essentially of a mass of topographical and social details plus the inevitable "use of the globes." It was only slowly emerging as an independent discipline out of the strange but fascinating complexity of cosmography and, as G. R. Crone has recently said, "geography was uninspired by any unifying and vitalizing concept[29]." The principle of causality was rarely invoked, little or no attempt being made to trace cause and effect ; neither was the idea of the adjustment of human activity to the physical environment developed. Both these scientific aspects of geographical study were alien to the times but, notwithstanding the unscientific approach, geographical education received a distinct impetus. It was unfortunate for geography that the times produced no great geographical thinker and too few geographical educationists of the calibre of Hezekiah Woodward and Joseph Priestley.

---

[28] Warrington, T. C., " Newton and Geography," *Geography*, vol. 28, 1943, p. 5.

[29] Crone, G. R., " The Men Behind Modern Geography : 1. Sir Joseph Banks.", *Geogr. Mag.*, 1949, p. 142.

Thus the Dissenting Academies and the geography taught in them. What conclusions can be arrived at ? Firstly, that geography was slow in gaining a place in the curriculum but that eventually it came to be quite regularly taught and whilst it was less handsomely treated than some of the new " modern " subjects it was served more generously than in the universities and grammar schools. Secondly, for a long time geography was not a taught subject though it was fairly frequently included in the students' studies ; private reading with questioning and commentary was more common than delivered lectures until later times. Gradually during the 18th century an increasing proportion of the timetable came to be devoted to geography which became an integral part of the curriculum. Thirdly, such geography as was taught tended to have a mathematical bias. Whilst the great discoveries had excited interest in the social as well as the environmental differences between various parts of the earth, geography, in England, since the end of the 16th century had become increasingly linked with astronomy and mathematics as a result of developments in science and navigation : it was thus natural that the mathematical aspects of geography should begin to predominate. This was not altogether amiss for by absorbing some of the logic and precision of mathematics geography was helped to shed its unscientific, encumbering, fanciful cosmographical side.

TWO DRAINAGE DIVERSIONS IN DORSET

B. W. Sparks*

DURING the course of a recent visit to the Weymouth lowland two unusual diversions of drainage were noticed, both of them occurring in the Portland ridge of the northern flank of the Weymouth anticline. In themselves they are only minor features of the landscape, but they throw some light on the probable method of stream capture in areas of permeable strata and upon the relationship between consequent and subsequent drainage. Their understanding requires a broad consideration of the structure, lithology and erosional history of this complex area of Mesezoic strata.

The Weymouth anticline is, in broad outline, a typical asymmetric mid-Tertiary fold, showing the steeper dips in its northern limb and

---

* Mr. B. W. Sparks is demonstrator in Geography in the University of Cambridge.

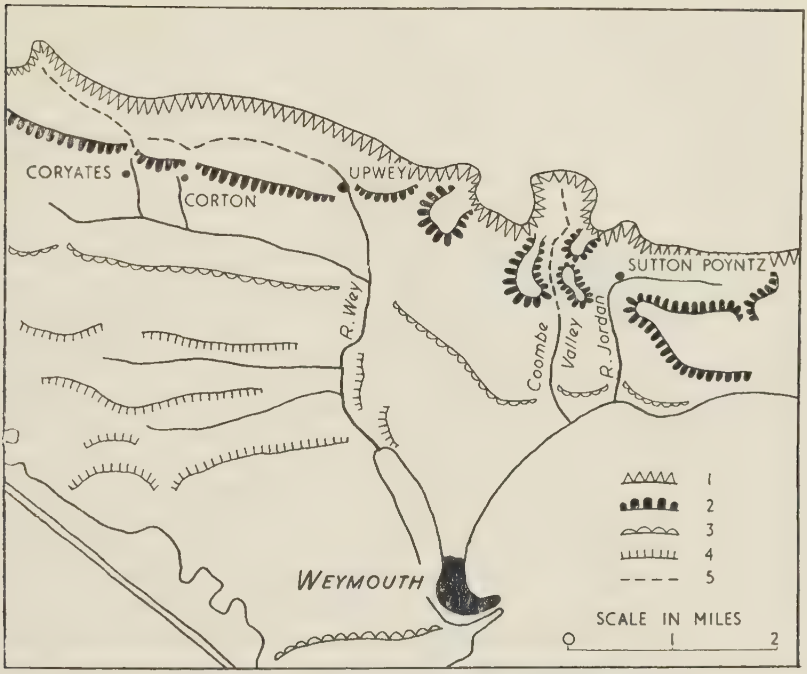


Fig. 1.—The escarpments of the Weymouth lowland. 1, Chalk ; 2, Portland ; 3, Corallian ; 4, Cornbrash ; 5, Dry valleys.

affecting all strata from at least Fuller's Earth to Upper Chalk[1]. Its northern margin is marked by a fault-zone, which has had a long and complicated history, but which, for topographical purposes, may be described as a reversed fault due to pressure from the south. The line of the Chalk escarpment (Fig. 1) approximates to the line of the fault-zone. In detail, the northern part of the anticline is complicated by minor folding, some of Lower Cretaceous date, some of the same mid-Tertiary age as the main Weymouth anticline. The folds in the area under consideration are the Upwey syncline, occupied by the valley to the west of Upwey, the Sutton Poyntz pericline, etched into a remarkable anticlinal vale by the diminutive River Jordon, and the Boiling Rock and Upton synclines, responsible together for the preservation of the Portland ridge on the southern side of the Sutton Poyntz pericline.

The drainage consequent upon such a structure must have been very different from the present pattern of obviously superimposed southward-flowing streams fed by strike tributaries draining the Jurassic clay vales. The close resemblance between this pattern and drainage of similar type in Wessex and Sussex has led Wooldridge and Linton[2] to consider the Weymouth region as part of the area covered by the early Pliocene marine transgression, which has left its mark elsewhere in a bench at 650–550 feet O.D. There is good reason, although the full evidence cannot be given in this short note, to consider that much of the area has suffered repeated lower and later marine transgressions, which have wiped clean the developing features of the landscape, including, probably, subsequent stream development along the clay vales, and re-established the superimposed north-south drainage.

---

[1] Arkell, W. J., The Geology of the Country around Weymouth, Swanage, Corfe and Lulworth, *Mem. Geol. Surv.*, 1947.

[2] Wooldridge, S. W., and Linton, D. L., *Structure, Surface and Drainage in South-East England*, Inst. Brit. Geogr., No. 10, 1939.

The effects of lithology are to be seen in the striking pattern of scarp and vale developed in the alternating Jurassic limestones and clays south of the Chalk escarpment. Where the dips are steep, some 10–20 degrees in the northern limb of the Weymouth anticline, the pattern is more aptly described as hog-back ridge and vale ; to the east, where the structure is more complex, the simple linear relief pattern is replaced by sharply-flexured escarpments and almost enclosed lowlands. In addition to this general picture of limestone and clay alternations, it is imperative, for the understanding of the stream diversions, to consider the detailed lithology of the following Upper Jurassic strata.

> (3) *The Purbeck beds* consist of some 200 feet of greatly varied strata, in general susceptible to erosion, not because they are all lacking in resistance, but because of the intercalation of shales and clays between the limestones, which are individually sufficiently resistant to project in places as bare rock scars.
>
> (2) *The Portland beds* possess two main divisions. The upper is the Portland Stone, comprising some 40–50 feet of limestone, the Freestone above and the Cherty Series below, the whole being generally resistant. The lower is the Portland Sand, consisting of 80–90 feet of non-resistant sands, but including some massive and very resistant cementstone bands. Of these, one bed, some 25 feet in thickness, in the upper middle part of the Portland Sand, is of importance in the Portland ridge near Coryates (Fig. 1).
>
> (1) *The Kimmeridge clay*, some 800 feet thick, is the impermeable stratum underlying the Purbeck and Portland beds and causing the spring line, the most important in the region, at the base of the Portland Sand.

Coombe Valley

The course of the valley, now dry in its upper part, may be followed from Fig. 1. It starts in a large hollow in the Chalk escarpment, not a flat-floored, corrie-like form such as characterises the escarpment of the South Downs, but a shallow depression with gently-sloping sides. For a short distance the valley is diverted to the west along the faulted boundary of the Chalk (Fig. 2), but then regains its southerly direction to cut across the synclinal mass of Portland and Purbeck beds, on which are developed Green Hill, Chalbury Camp and the broad 395-foot summit to the west (Fig. 2). The spring head of the present valley is at the base of the Portland Sand at a little over 100 feet O.D., and from

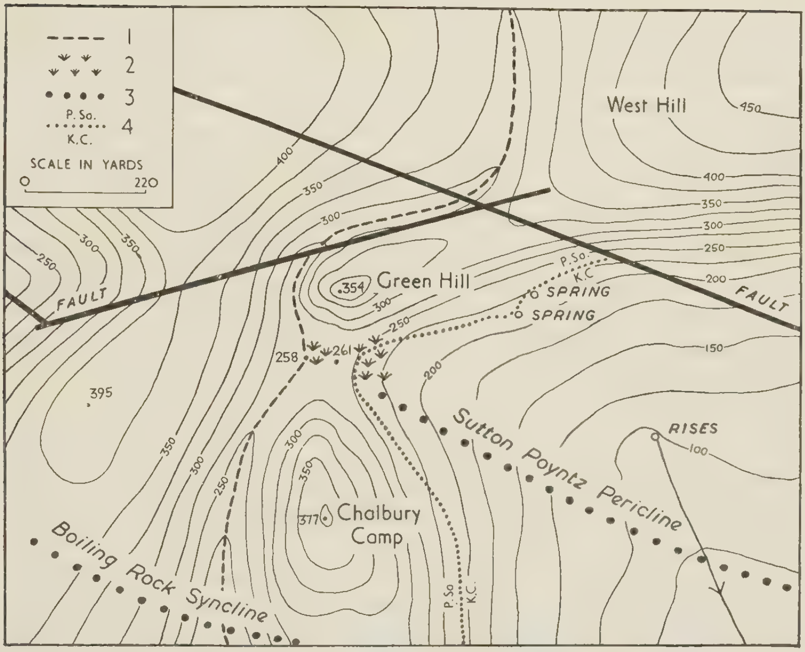


Fig. 2.—Structural features and landforms at the head of the Coomb Valley. 1, Dry valleys ; 2, Marsh ; 3, Trend of axes of local folding ; 4, Base of Portland Sand.

here a minute stream flows against the dip across the low Corallian cuesta to the sea (Fig. 1). This short valley, one of the superimposed north-south elements of the drainage completely out of harmony with the structure, possesses one remarkable feature mapped in Fig. 2, which is a sketch based upon the 6 inch map, supplemented by aneroid and Abney levelling in the field.

The valley through the Portland upland is a narrow steep-sided form typical of limestone country, with one exception : the remarkable breach to the east between Green Hill and Chalbury Camp. Instead of the usual valley some 60–100 feet deep, the eastern flank is completely destroyed for a distance of approximately 100 yards. The surface divide, at 261 feet O.D., is a mere 3 feet above the floor of Coombe valley, which here flattens slightly and is occupied by a patch of damp, reedy ground indicating some slight percolation down the valley even at the present. The occurrence, immediately within the Sutton Poyntz vale, of many patches of reeds and two small springs, all near the Portland Sand–Kimmeridge Clay junction, clearly points to seepage from Coombe valley through the Portland Sand, which floors it, to the spring line in the Sutton Poyntz vale. In view of the position of the two small springs shown in Fig. 2, a similar underground seepage may take place below the col between Green Hill and West Hill.

An examination of the ground shows that the area can have suffered no marine transgression below the 380-foot level, and, therefore, a considerable time has been available for the underground capture. The action of the river Jordon and its spring-fed tributaries steadily eroded the subsequent Sutton Poyntz vale in the thick mass of Kimmeridge Clay. Erosion along the axis of the anticline, where the Kimmeridge Clay attained its highest elevation, caused the precise location of the breach in the eastern side of Coombe valley. The linking of the surface floor of Coombe valley with the Sutton Poyntz vale is not yet complete, but the Portland beds are so thinned that an abstraction of drainage underground has occurred. Such a capture obviously requires special sub-surface conditions, but the permeable beds responsible here are not a prime necessity. Howard[3] has pointed to an underground capture at present in progress in the Yellowstone National Park, where a shattered fault-zone is the root-cause of diversion.

CORYATES GAP

A glance at Fig. 1 will give the general setting of Coryates gap, which is shown in more detail in Fig. 3. The Portland ridge, extending westwards from Upwey, is a sharply-defined hog-back feature, scarred by the more resistant of the limestone beds. As far west as Corton, and again west of Coryates, the ridge is composed mainly of Portland Stone with a thin capping of Lower Purbeck beds, but in the middle area the Portland Stone outcrop swings to the north of the Friar Waddon valley. At Corton Hill the ridge owes its sharpness entirely to the thick cementstone in the upper middle part of the Portland Sand. The cementstone outcrops in the Corton gap and rises westwards—hence the asymmetric east-west profile of Corton Hill.[1,4]

The Portland ridge reaches a summit elevation of 430–400 feet O.D., and the area to the north, therefore, is unlikely to have experienced a marine transgression below this level. The original consequent streams originating from, or extending over this level appear to have been the Wey and two minor streams flowing respectively through Corton and Coryates gaps, the course of the last being probably from Black Down along Hell Bottom. The Wey and the Corton gap stream developed subsequent right bank feeders in the weak strata preserved in the Upwey syncline : the formation of the Friar Waddon valley, tributary to the Wey, was probably due to the preservation of Wealdon beds at the level of initiation, while the strike tributary of the Corton gap stream appears to have been initiated in the weaker upper part of the Portland Sand. Traces of an old high-level valley-floor at a little below 350 feet O.D. in the Coryates gap indicate the abandonment of the gap at that level, the drainage having been captured by the right bank, subsequent tributary of the Corton gap stream. The latter, in turn, was captured by the right bank subsequent feeder of the Wey, and thus was initiated the compound Friar Waddon valley, partly in Purbeck beds and partly in Portland Sand.

---

[3] Howard, A. D., "A Case of Autopiracy," *Journ. Geomorphology*, vol. 1, 1938, pp. 341–2.

[4] Arkell, W. J., "The Portland Beds of the Dorset Mainland," *Proc. Geol. Assoc.*, vol. 46, 1935, pp. 301–47.

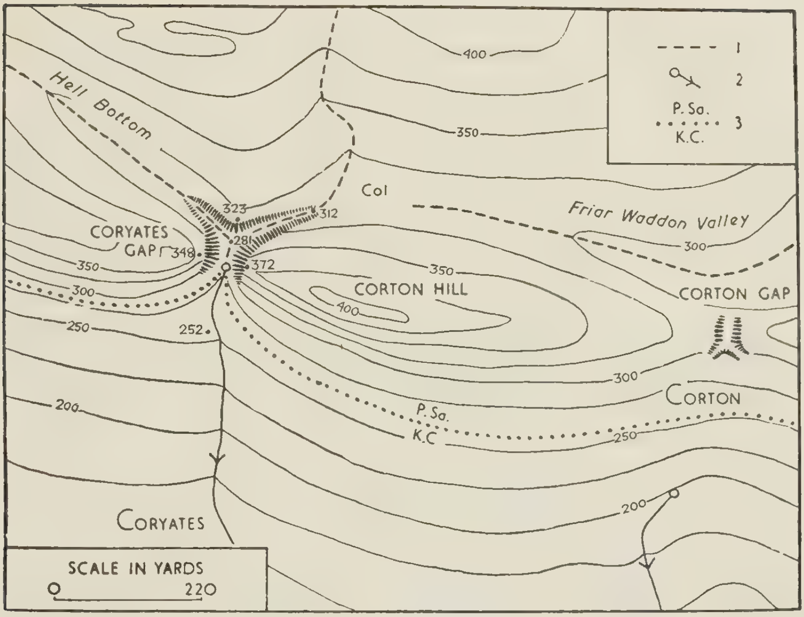


Fig. 3. Landforms at Coryates. 1, Dry valleys ; 2, Springs ; 3, Base of Portland Sand.

The Friar Waddon valley is now dry, the spring head of the Wey being found at Upwey, but the valley is no longer continuous : it has been disrupted at the Coryates gap. Within the old, high-level valley-floor of the Coryates gap is a second, extremely youthful cleft, at the bottom of which a spring appears near the Portland Sand–Kimmeridge Clay junction. To the west of the spring a slope of 40 degrees leads to an abrupt break at 348 feet O.D., while, to the east, a slope of 37 degrees is terminated sharply at 372 feet O.D. These slopes, developed in the lower part of the Portland Sand, are unstable and scarred by innumerable small slumps, to which cattle, no doubt, contribute. Hell Bottom and another small valley from the north (Fig. 3), marked on the ground by a line of coarse grass, now lead into the Coryates gap, but are separated from the surviving portion of the Friar Waddon valley by an almost imperceptible col at a little below 320 feet O.D.

The remarkable freshness of the Coryates gap raised suspicions of a human origin, especially as the Corton gap possesses an artificial cutting some ten feet deep through the main cementstone. It appears unlikely, however, that the Coryates gap can have a similar origin : if it is a road-cutting the makers of a country lane must have carved a trench some 75–100 feet deep through the Portland Sand. Admittedly man has caused some minor modifications in his passage along the tracks leading into the gap from the north, but the hollow at the spring head appears to be a natural phenomenon. Some confirmation is provided by the very names Corton and Coryates, both deriving from O.E. '*corf*,' a pass (c.f. the site of Corfe Castle in a remarkable gap through the chalk). Indeed, Coryates (the gate of the pass) was mentioned in A.D. 741,[5] and it seems very unlikely that early man would have indulged in major road making operations especially when Corton gap was available at a distance of half a mile to the east.

Granted that the gap is a natural one, it probably evolved in the following manner. As base-level fell intermittently in Quaternary times, the Kimmeridge vale south of the Portland ridge was lowered more readily than the Friar Waddon valley, floored by Purbeck and Portland beds. Springs issuing at the Portland Sand–Kimmeridge Clay junction sapped at the base of the Portland ridge. These springs, be it noted, must be fed largely from the Portland and Purbeck beds, and, the nearer they approached the Portland ridge, the more rapid the seepage from the Friar Waddon valley. The loss of water diminished the flow of the Friar Waddon stream, decreased its erosive power and, at the same time, increased the power of the springs. There were two points, at Corton and Coryates, where the distance from the Friar Waddon stream to the spring line was least, and where seepage was most facilitated. At either of these points disruption was probable : the exact location of the breach, Coryates gap, was determined by the disposition of the strata. Although the thickness of strata to be cut through at Coryates was greater than at Corton, the latter gap was floored by the resistant cementstone mentioned above. The manner in which this bed forms the sharp crest of Corton Hill is a good indication of its resistance to erosion. At Coryates it lay along or slightly north of the axis of the Friar Waddon valley, and the spring had merely to sap through the sands below the cementstone. The initial diversion was probably accomplished underground, but a surface capture has occurred as well.

The great interest of the Coryates gap lies in the light which it throws on the relation between consequent and subsequent drainage. In the orthodox treatment of the development of scarp and vale topography, the progress of the geographical cycle involves the gradual elimination of consequent streams by the development of major subsequent streams. Up to a point this occurred in the area under consideration, but, at a later date, the consequent, or rather its short obsequent successor, reversed the process by cutting back to capture the subsequent. It is believed that this type of development requires special conditions of movement of base-level, namely an intermittent fall. During the stillstands the subsequent streams develop : during the falls of base-level, or immediately afterwards when the drainage is still incompletely adjusted to the new base-level, the consequent streams have the opportunity to disrupt the subsequents, provided that the disposition of rocks is suitable. As the whole of southern England has been affected by an intermittently-falling base-level since, probably, the early Pliocene, such recaptures of subsequent streams should cause no extraordinary surprise.

---

[5] Ekwall, E., *The Concise Oxford Dictionary of English Place-Names*, Oxford, 1936.

In a recent paper on the South Downs[6] I have suggested a similar hypothesis of drainage development to explain the etching out and dissection of the secondary Chalk escarpment. Such a hypothesis is given more plausibility by the more concrete evidence from Dorset. The preliminary underground abstraction of drainage is as possible in the Chalk as in the Portland Beds, and there is good reason to believe in the efficacy of spring sapping in the Chalk.[7]

I must express my appreciation to the Central Research Funds Committee of the University of London for a grant to cover the cost of maps and travelling involved in this investigation.

---

[6] Sparks, B. W., " The Denudation Chronology of the Dip-Slope of the South Downs," *Proc. Geol. Assoc.*, vol. 60, 1949, pp. 165–215.

[7] Lewis, W. V., " The Pegsdon Dry Valleys," *Compass* (Mag. Camb. Univ. Geogr. Soc.), vol. 1, 1949, pp. 53–70.

◆

A GLOBE SEGMENT

F. V. Botley*

For hundreds of years mathematicians and geographers have made serious efforts to solve the problem of mapping the entire sphere on a flat sheet. It is, of course, impossible to do this without gross distortions at the edge of the map, or without interruptions at the edge of large areas. For any specific distribution therefore, one is compelled to choose the lesser of two evils—a globe which is accurate in all respects, but is severely limited in size by considerations of expense, storage and transport, or a distorted flat map which may be drawn on any required scale and which is more convenient than the globe in every possible way.

For portions of the globe of continental or sub-continental size there is a very effective compromise, which has not received all the attention which it deserves.[1] This is the globe segment, suitable for scales between about 1/1,000,000 (16 miles to the inch) and 1/16,000,000 (250 miles to the inch). The segment, as Fig. 1 shows, consists of a small slice cut from a large globe, mounted on to a wall, table, or other flat surface. Such a map avoids many of the shortcomings of a full size globe, yet areas, distances, bearings and shapes are correctly represented. Great circle routes may be plotted directly on to its surface by means of a ruler shaped to fit its curve, and it would, therefore, be a useful adjunct to the navigation room of an airport. In schools and universities it would serve as an undistorted general map of the area chosen, at the same time being a perpetual reminder of the sphericity of the earth and of the inadequacies and distortions of flat maps.[2]

---

* Mr. F. V. Botley has made particular study of Map Projections and contributed an article on "A Tetrahedral Gnomonic Projection," in *Geography*, vol. 34, 1949, pp. 131–136.

[1] For previous uses of globe segments see the following :—Reclus, E., " On Spherical Maps and Relief," *Geogr. Journ.*, vol. xxii, 1903, p. 290. Wright, J. K., " The World in Maps," *Geogr. Rev.*, vol. xxx, 1940, p. 1. Anon., "Air Navigation for Global War," *Fortune*, Jan., 1943, p. 7. The last named describes D. A. McMillan's method of solving astro-navigation problems by the use of an accurately constructed Global Ruler. A somewhat similar method is also described in *The Earth : a Manual in Global Geography*, Rand McNally, 1944.

The purpose of this article is to give instructions and tables for the making of such a globe. It is suggested as a useful and instructive exercise for groups of students, scholars and geographers.

The radius of the segment may be determined by reference to an atlas map. Fig. 2 makes it clear that if α is the radius of the small circle boundary, then the radius of the segment (i.e., the distance AD) is

$$R\sin.\ \alpha$$

and that the height of the centre above the baseboard, i.e., the distance CD, is

$$R(1-\cos.\ \alpha)$$

Similarly, if given the angular distance of the point P from the centre C, we can use these formulæ to calculate its vertical distance from the point C, and its horizontal distance from the central axis.

For a segment of 20° radius, cut from a metre globe (R = 50 cms.), the co-ordinates of the curve (in centimetres) are as follows :—

TABLE I

A Angle from centre	B Vertical Distance from Base	C Horizontal Distance from centre	A Angle from centre	B Vertical Distance from Base	C Horizontal Distance from centre
0°00′	3·02	0·00	10°00′	2·26	8·68
0°30′	3·015	0·44	10°30′	2·18	9·11
1°00′	3·01	0·88	11°00′	2·10	9·54
1°30′	3·00	1·32	11°30′	2·01	9·97
2°00′	2·99	1·75	12°00′	1·92	10·40
2°30′	2·97	2·18	12°30′	1·83	10·82
3°00′	2·95	2·62	13°00′	1·74	11·25
3°30′	2·92	3·05	13°30′	1·64	11·67
4°00′	2·90	3·49	14°00′	1·53	12·10
4°30′	2·86	3·93	14°30′	1·42	12·52
5°00′	2·83	4·36	15°00′	1·31	12·94
5°30′	2·79	4·79	15°30′	1·20	13·36
6°00′	2·74	5·23	16°00′	1·08	13·78
6°30′	2·70	5·66	16°30′	0·96	14·20
7°00′	2·64	6·09	17°00′	0·83	14·62
7°30′	2·59	6·53	17°30′	0·70	15·04
8°00′	2·53	6·60	18°00′	0·57	15·45
8°30′	2·47	7·39	18°30′	0·43	15·87
9°00′	2·40	7·82	19°00′	0·29	16·28
9°30′	2·33	8·25	19°30′	0·15	16·69
			20°00′	0·00	17·10

---

[2] The B.E.A. issues a free map of European air routes, drawn on the same scale as that of the globe segment described. A direct comparison of the properties of the two may therefore be made.

These figures are intended for a small segment of Europe, but may be used for *any* segment up to a 20° radius by multiplying all the B and C figures by a common factor. For a globe of 100 inches, for instance, the distances should be doubled and measured in inches.

Before constructing the globe from layers of cardboard, papier mâché or clay, a Global Ruler should be made by plotting the figures in Table I on to the bottom edge of a piece of graph paper, the horizontal distances being measured to the left and right of a vertical axis. The graph paper is then glued to a piece of cardboard or plywood and the arc cut out, as in Fig. 3A. A mark is made to distinguish the middle point and intervals of $\frac{1}{2}°$ marked outwards from it. This ruler is used to check the shape of the segment at all stages of construction.

Circular rings of cardboard are now glued together, decreasing in radius towards the top layers, so that they fit the curve as shown in Fig. 4A. Eight sheets of 20 × 30 in. cardboard of 1 mm. thickness are sufficient for the Europe map described here.

The thickness of one, two, three, etc., layers of cardboard represents the vertical distance from the base. The average thickness of glue and cardboard is found by sticking several pieces together, pressing them, and measuring them when dry. This is very necessary, as the glueing and pressing alters the vertical distances considerably.

The radius of each successive layer of cardboard is obtained by finding its height above the base in column B of Table I and interpolating its radius from column C. As an example, if 20 test layers are 1·6 cms. thick, the average for one layer is 0·08 cms. The 4th layer is, therefore, 0·32 cms. above the base, and its radius is about 16·20 cms.

Starting with the largest, each ring is cut to its correct size, glued, and pressed to the one beneath it. When this process is finished the model should appear as in Fig. 4A. The whole segment should then be mounted on to a ring of 17·10 cms. radius, so that the edges project above the global curve, as in Fig. 4B.

When absolutely dry the model should be rubbed down to a smooth curve with fine sandpaper, the Ruler being applied in all directions to check the work. Pieces of paper should now be cut to the shapes shown in Fig. 5, glued to the surface in the order indicated, and sandpapered along the overlapping edges. Good quality paper should then be cut and stuck in a similar fashion, the overlapping being reduced to the barest minimum.

A quicker but less satisfactory method of construction is to model in clay or papier mâché. Of these two methods the more satisfactory is to nail a wooden block to the baseboard and to hammer panel pins into the surface of the block and the surrounding board so that their heads come to within $\frac{1}{8}$ in. of the Global Ruler curve. Papier mâché is then moulded round these, glue being used as a binding material.

The baseboard should now be prepared to receive the globe. A piece of paper is stuck to it, and a circle of radius 17·10 cms. drawn upon it. A scale of degrees is marked round this, beginning at 0° at the north and moving in both directions to 180° in the south.

The segment globe should be glued into position and a central meridian drawn upon it, with the aid of the Global Ruler, from 0° to 180°.

The Ruler may now be cut down to the shape shown in Fig. 3B, since it is too long for great circles other than those running through the central point of the segment. A scale of miles should also be marked on the reverse side, 1 deg. 27 min. being equivalent to 100 miles.

Intersections of the graticule may now be plotted as bearings and distances in degrees from the centre, the Ruler and the circular degree scale being used to obtain these figures.

If C is the central point and P another point which requires to be identified, the distance between the two may be calculated by means of the cosine formula :—

cos. Distance = (sin. Lat. C) (sin. Lat P) + (cos. Lat. C) (cos. Lat. P) (cos. Long.) where Longitude is the longitudinal difference between C and P.

The sine formula may then be used in its following form :—

sin. Bearing = (cos. Lat. P) (sin. Long.) (cosec. Distance).

From these two formulæ the following table may be constructed for any map centred at a point on the 50° parallel.[3]

TABLE II

Latitude	Longitude East or West of the Central Meridian 5°	10°	15°	20°	25°	30°	Edge of Map
65°	(a) 15°12′ (b) 8°05′	15°42′ 15°44′	16°55′ 22°05′	18°15′ 27°30′	19°51′ 31°43′	— —	(25°36′) 32°16′
60°	(a) 10°21′ (b) 13°58′	11°29′ 25°49′	13°07′ 34°46′	15°06′ 41°02′	17′18° 45°17′	19°39′ 48°02′	(30°43′) 48°18′
55°	(a) 5°48′ (b) 29°39′	7°46′ 47°28′	10°24′ 55°20′	13°03′ 60°21′	15°53′ 62°20′	18°45′ 62°09′	(32°10′) 63°14′
50°	(a) 3°06′ (b) 88°00′	6°20′ 87°10′	9°36′ 86°10′	12°45′ 85°06′	15°58′ 80°54′	19°07′ 79°00′	(31°23′) 78°06′
45°	(a) 5°54′ (b) 143°10′	8°18′ 121°42′	11°15′ 110°15′	14°18′ 101°42′	17°29′ 95°15′	— —	(28°54′) 87°30′
40°	(a) 10°33′ (b) 158°36′	12°09′ 140°54′	14°30′ 127°38′	17°12′ 117°36′	— —	— —	(24°46′) 111°15′
35°	(a) 15°24′ (b) 164°25′	16°38′ 150°12′	18°32′ 138°10′	— —	— —	— —	(18°10′) 131°42′

(a) Distance of point from C. (b) Bearing of point west or east of north.

The last figure for each parallel in (b) is the bearing of the point where the parallel meets the edge of the segment at 20° from the centre.

The last figure in brackets at (a) is the *longitude* of this point.

---

[3] For tables similar to Table II, at latitudinal intervals of 5°, see Hammer, E., *Kartenprojektionen*, Stuttgart, 1899. Table II may also be used for the drawing of any oblique azimuthal projection tangent at 50° N. or S.

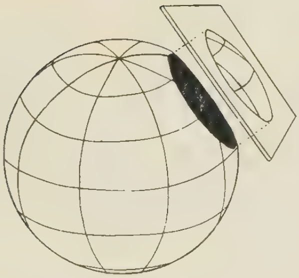


FIG. 1

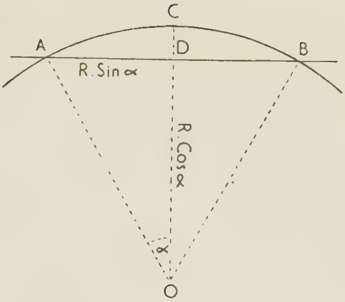


FIG. 2

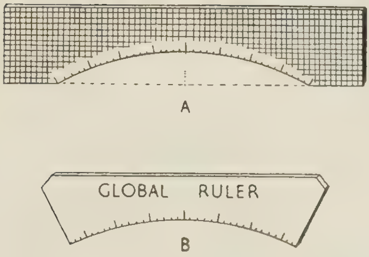


FIG. 3

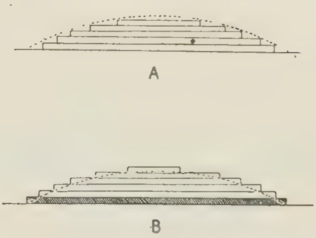


FIG:4

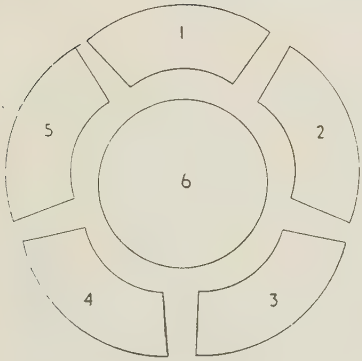


FIG.5

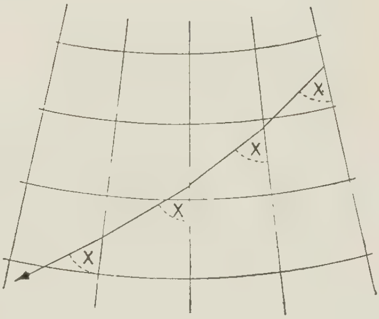


FIG.6

Fig. 1.—Removal of a segment from a large globe.

Fig. 2.—Dimensions of the segment. Since OD = R.Cos.a, CD is obviously R(1 − Cos.a).

Fig. 3.—A : Graph Paper stuck to plywood.
B : Final shape of Global Ruler.
The total length is between 30° and 35°.

Fig. 4.—A : Cardboard rings cut and glued to fit Global Ruler.
B : Extra ring of radius AD added. Projecting edges are then sandpapered to fit dotted curve.

Fig. 5.—Paper cut to cover global surface. The shape of the paper is found by trial and error after laying sheets of it on the global surface.

Fig. 6.—Approximate plotting of a rhumb-line. The same angle is made at each meridian with a flexible protractor.

The meridian should be drawn through these points with the aid of the Global Ruler, and the parallels drawn with the aid of drawing curves. Intervening lines at 1° intervals may then be sketched in as guide lines, and the continental outlines, airports, and other data drawn and inked in. Clear varnish should then be applied over the whole surface of the map.

A UNIVERSAL SYSTEM OF MAP REFERENCING

B. C. WIDDOWSON*

THE official grids of reference which have been adopted in various places in recent years are extremely convenient for those whose interests are confined to a definite area : but they are much less so to anyone whose interests lie in areas served by different grids, or even an area where two grids meet : in that case, the fact that the grids are entirely arbitrary and bear no relationship to each other becomes annoyingly obvious. It is the purpose of this sketch to give a brief description of a system of referencing which shall be theoretically justified and universally applicable. Inevitably it is not entirely accurate : but the error never amounts to as much as a kilometre, and that is amply accurate for any topographical, as opposed to cadastral, purpose.

The earth is first divided into eight major areas, which we will conveniently, even if inaccurately, call quadrants, by the equator and the Greenwich meridian, and the 90° E. and W. Each of these is designated by a letter—E (for Europe), C (for China), V (for Vancouver), A (for Atlantic), K (for Kalahari), Z (for New Zealand), P (for Pacific), B (for Brazil). Each quadrant is divided into 100 parts, numbered from 00 to 99, 9° each way in latitude and longitude. Each of these areas is then supposed to be depicted on a map drawn to a polyhedral projection. We now assume—and it is sufficiently true for topographical purposes—that the earth is a perfect sphere, and that the original determination of the metric system was perfectly accurate. Our resultant figures always measure 1,000 kilometres from North to South, and up to 1,000 from East to West. The northing part of our reference is simply the number of kilometres measured northwards from the southern boundary, and, with the second figure of the area number, is in fact the latitude on the centesimal system. The easting reference is a little more complicated. Here the mid line of the area is always taken to be 500 and the kilometres measured forwards or backwards from it.

---

* Mr. Widdowson contributes his note on a system of map referencing from an island off the coast of British Columbia, typed on paper salvaged from the sea.

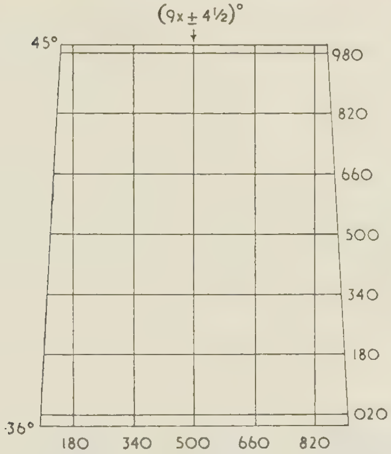


Fig. 1.—Grid for 9° area, scale 1 : 20,000,000.

The references are easily calculated from the latitude and longitude. In the former case, the amount by which the latitude exceeds, in minutes, the next smaller multiple of 9° is multiplied by 1·8519. In the latter case, the number of minutes by which the longitude exceeds or falls short of the next smallest multiple of 9°, plus 4½°, is found. This is then multiplied by 1·8519 and also by the cosine of the latitude, and the resultant number added to or subtracted from 500, as the case may be. For example, take Königsberg (grad). The latitude is given as 54° 42′ : this is 42′ more than 54° : multiply by 1·8519 : the result is 78 : the northing reference is 078. The longitude is 20° 30′ : the next smaller multiple of 9°, plus 4½, is 22½ : the longitude falls short of this by 120′ : multiply this by 1·8519 and the cosine of the latitude (0·57786) and we get 128. This must be subtracted from 500 : the easting reference is 372. As the place falls in area B25, the complete reference is B25/372078. A similar reference will define any place on the earth's surface to within one kilometre, if the necessary adjustment is made for the southern hemisphere, where we shall have southing in place of northing.

The principle may be extended for educational purposes by developing it into a fixed grid ruling for all maps. The graticule for very small scale maps would be ruled at intervals of 18°, 9°, or 4½°, and the student will know that the parallels are 2,000, 1,000, or 500 kilometres apart.

For larger scale maps, the map will be an agglomeration of 9° areas, with what slight adjustment may be necessary to make the map continuous. And within each area the reference lines will be ruled for references 020, 180, 340, 500, 660, 820, 980, and the lines, being 160 kilometres apart, will make 100 *mile* squares over the greater part of the map. When the scale gets large enough to justify it, not only will these reference lines be ruled, but also, in a different colour, the reference lines at 40 kilometres difference (i.e., 020, 060, 100, 140, etc.)

will be shown. Blue and red are suggested, as these colours are bound to be used in any coloured maps : and the student will know that in any place, a blue square is a 100 mile square : in the same way, the red squares will always be 25 mile ones (i.e. 40 km.). Thus the danger of difference of scale not being appreciated will in large degree be obviated.

Further, the same principle may be applied to the making of map memoranda, to ensure that they always conform to a definite system, so that they can be related one to another as readily as possible. If a double foolscap sheet of paper is cut into six parts, each part will accommodate a 9° area on a scale of one to five million : the four parts of the area drawn to double the scale can be designated A, B, C, D ; and the four parts into which each of those will be divided to get a map on a scale of 20 miles to one inch can again be indicated by the additional letters a, b, c, d. If a really large scale memorandum is required, each of these sixteen sections can be divided into twenty-five subsections and indicated by numbers, and the scale will be four miles to an inch. For any still larger scale the utility of the principle disappears. By a fortunate coincidence, on such a page of paper, a ruling at 21-point intervals will give exactly 27 spaces in the 20 cm. of the map, which will correspond to a latitude difference of 20′, 10′, or 5′ for the three smaller scales which have been mentioned : for the longitude, of course, there can be no short cut.

Finally, to illustrate the proposed grid for educational purposes, Fig. 1 shows a 9° area on a scale of one to twenty million.

Ceylon :

Its Geography, its
Resources and its People
ELSIE K. COOK, F.R.G.S.

This new edition of "A Geography of Ceylon" revised and brought up-to-date by K. Kularatnam, M.A.(Lond.) may be recommended with confidence as a mine of factual information about the geographical aspect of Ceylon and as a real help to the understanding of its people.
Illustrated 12*s*. 6*d*.

Macmillan & Co., Ltd.

HEFFER'S*

****The Bookshop known the world over***

New and Secondhand, English, American, European and Oriental Books. Learned, rare and standard works bought; *lists invited.*

★

W. HEFFER & SONS LTD,
PETTY CURY CAMBRIDGE

A Regional Geography

PT. III—AUSTRALIA & NEW ZEALAND

L. DUDLEY STAMP *Fifth (Revised) Edition*

This new edition has been thoroughly revised to include changes which have taken place during and since the Second World War. It is arranged to cover the requirements of the first years of a university course, post-matriculation courses, and the syllabuses of various boards at the Advanced Level of the General Certificate of Education. As nearly all such courses require varying degrees of specialisation, this book should prove valuable for the student who requires to concentrate his studies on these countries. 7*s*. 6*d*.

PT. IV—ASIA

L. DUDLEY STAMP *Tenth (Revised) Edition*

Recent years have witnessed such great changes in the political geography of Asia, that although present conditions are far from stable in many countries, it was felt that an endeavour should be made to make this geographical picture of the continent as up-to-date as possible. This has therefore involved the rewriting of considerable portions of the book and this new edition now appears thus revised. 12*s*. 6*d*.

Geography for Today

BOOK 5: THE WORLD

T. HERDMAN *Edited by L. Dudley Stamp and L. S. Suggate*

It is in response to the requests of many teachers that Mr. T. Herdman has prepared this final volume on the World. The book will serve both those who require a world book for the purposes of the General Certificate examination, as well as those who need a revision course preparatory to more advanced studies. 10*s*. 6*d*.

The Soviet Union

THE LAND AND ITS PEOPLE

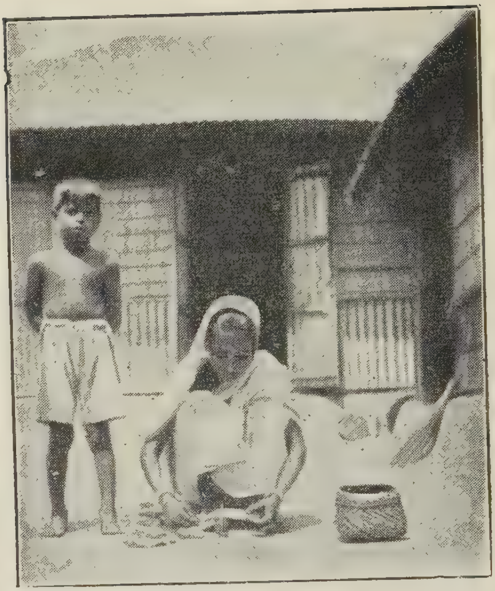
GEORGES JORRÉ *Translated from the French by E. D. Laborde*

" This is a book which advanced students of the geography of Russia will find most useful. A geographical textbook on this area, which has hitherto been so devoid of information, has long been overdue and this volume should be of interest to students of world affairs as well as geographers."—*Higher Education Journal.* 21*s. net*

LONGMANS

6 & 7, CLIFFORD STREET, LONDON, W.1

Study this example of Picture Reading



YOU CAN FIND OUT MORE about picture reading, as it is developed in Geography First Series for pupils of 7 to 11, by sending now for "Teaching Geography" (1s. 6d.), which is offered free to teachers. Refer particularly to pages 42—65.

Roshik, the little Bengali boy in this picture, is the central figure of one of the six stories in Archer Thomas Geography Book One. This four-book course for 7 to 11-year-old pupils is magnificently illustrated by photographs, drawings and maps, and provides a thorough training in the art of picture reading. For example the following paragraph, taken with the picture, conveys facts and ideas which could not be gained from the text alone.

" Roshik's mother is cutting up a fish to cook for dinner. Look carefully at the picture, and you will see that she is holding the knife between the toes of her right foot. Behind Roshik you can see a little hut. The hut has one room. Roshik's family use it for their kitchen and their dining-room. They have another hut which they use for their bedroom. You can see a little of the bedroom hut on the right in the picture. Each of the two huts has a porch on one side. Look at the roofs of the huts. Are they flat or are they sloping ? Do you think Roshik lives in a rainy land or in a dry land ? "

FREE TO TEACHERS!

To : GINN AND COMPANY, LTD., 7, Queen Square, London, W.C.1.
Please send a free copy of " Teaching Geography," 128 pages (1s. 6d.) and details of *Geography First Series.*

Name.................................... *School*....................

.... G.11

CORRESPONDENCE

Geography at the Seventh New Zealand Science Congress.

At the seventh New Zealand Science Congress held at Christchurch in May, during the centennial celebrations of the province of Canterbury, a programme of papers and discussions was organised under Section F (Geographical Sciences). Following a more or less experimental meeting held during the previous Congress at Wellington four years ago, this was the first independent full-scale programme arranged for geographers. The section met in the Department of Geography, Canterbury University College, under the chairmanship of Mr. L. L. Pownall, M.A., who was assisted by Mr. M. McCaskill, M.A., as organising secretary. One day was devoted to studies in urban geography, another to land-use surveys and a third to methodological problems mainly related to geography training in schools, while members were also given an opportunity to attend a joint symposium on hydrology and land-use, a topic of particular significance in New Zealand, arranged by the Agriculture, Forestry and Soil Science sections.

Though attendance was comparatively small, enthusiasm was evident throughout the proceedings and the substance of almost all the papers revealed to a very satisfactory degree the remarkable development of geography which has taken place in the Dominion in recent years, a development which shows signs of even further acceleration as more trained graduates are encouraged to enter the research field.

Without in any sense making invidious distinctions, it is of interest to mention a few specific contributions as indicating some of the fields in which New Zealand geographers are at present working. Thus the chairman's address on "Urban Geography: its Aims and Methods," represented a theme commanding increasing attention in a country where, apart from the four main centres, towns are generally young and immature while performing very definite functions. The paper discussed the total complex of features which give character to a town and the development of specialised techniques for the measurement of urban phenomena. On similar ground, Mr. A. Tweedie of Otago University dealt with "The Concept of the Metropolitan Area," based largely on a survey of Dunedin. Mr. J. W. Fox of Auckland University College introduced a carefully constructed scheme for a full land-use survey of New Zealand, so contrived that it may have a wider application and thus form a contribution towards an international survey. The lively interest taken in teaching problems was reflected in a particularly sound and well-expressed statement on "Geography in New Zealand Primary Schools," by Mr. J. Martin of the Auckland Teachers' Training College.

The small but growing company of geographers in New Zealand deserve to be congratulated on taking their place in the Science Congress and on producing results which are so clearly based on sound foundations.

K. C. Edwards.

GEOGRAPHICAL ASSOCIATION

INTERNATIONAL CONFERENCE OF TEACHERS OF GEOGRAPHY, SHEFFIELD, JULY 30TH–AUGUST 7TH, 1951.

Plans for the first international conference in Sheffield are well in hand. We have received notice of support from many countries including Brazil, Australia, Canada, Siam, West and South Africa and from several European countries including Denmark, Sweden, Germany, Austria and Holland. British geographers will be well represented by Professors Fleure, Dudley Stamp, Bowen and East, and a number of teachers and lecturers from schools and training colleges. More than 100 delegates and members will attend the conference.

The excursions have been planned to give British and Foreign Geographers an appreciation of local and wider regional aspects of N. Midland Geography. A full report of the conference will be published in a forthcoming issue.

ANNUAL CONFERENCE, 1952.

The Annual Conference will be held in London at the London School of Economics from January 1st–4th (inclusive), 1952. Details of the programme will be published and circulated with the November issue of *Geography*.

SPRING CONFERENCE, 1952

The Spring Conference in 1952 will be held at Tenby under the direction of Professor Bowen, from April 4th–8th. A very attractive programme of lectures and excursions is being arranged and we advise members who wish to take advantage of this opportunity of seeing South-West Wales under Professor Bowen's expert guidance to reserve the dates, and in due course to apply early for accommodation. Full details and booking forms will be included in the January 1952 issue of *Geography*.

SUMMER SCHOOL FOR FIELD WORK IN GEOGRAPHY, 1952

At a recent meeting of the executive committee it was agreed that we should revive the custom of holding an annual Summer School of Geography, and arrangements are now in hand to hold a Summer School more especially devoted to field studies, from Aug. 2nd–16th, 1952, at Coleg-y-Fro, Rhoose, Glamorgan. Dr. Margaret Davies will act as organiser ; full details will be circulated in due course in *Geography*, but meanwhile members are recommended to note the dates of what promises to be a very profitable meeting.

BRANCH MEETINGS AT HEADQUARTERS

We are happy to record the use that is being made of our new headquarters by branches. The Sheffield, Liverpool and Leeds branches have met there—the two latter in the course of summer field excursions to the Sheffield region. A school excursion to the Sheffield region by about 90 children from Sowerby Bridge, Halifax, included a visit to Headquarters and an escorted tour of the city. From a Secondary Modern School in Bolton, Mr. H. J. Lowe, (Secretary of the Bolton Branch) brought 35 boys to visit headquarters and a nearby viewpoint overlooking the city for a brief urban study prior to a works visit.

We look forward to other visits from branches and from schools. Arrangements have been made for light refreshment to be served on such occasions. We are glad also to assist schools in the organisation of steel or cutlery works visits, as far as lies within our power by parties numbering not more than thirty, provided these are organised on weekdays other than Saturdays. Enquiries should be sent in to Headquarters well in advance of the date of the proposed visit.

SUMMER CLOSING OF HEADQUARTERS

Headquarters Office and Library will be closed from Saturday, August 18th, for staff holidays, opening again on Monday, August 27th.

FINANCIAL YEAR

Members are reminded that in accordance with the arrangements approved by the Annual General Meeting in January, the annual subscription for the next financial year falls due on September 1st, 1951, and not on January 1st, 1952.

We shall be grateful if members refrain from claiming the rebate of 2/6d., to which they are entitled in respect of the shortening of the current year, in view of the burden of rising costs which confronts all our endeavours at headquarters.

PUBLICATION DATES

The attention of members is again drawn to the changes in the publication dates of *Geography* announced in the March issue of the current volume (p. 60). The November 1950 issue which will contain the Annual Conference programme will, under the new arrangements, be the first issue for the financial year 1951-52.

O.S. MAP SETS

Members are reminded that the stock of sets of O.S. maps, with notes, has been renewed. Pictures and transparencies are still available. Our office staff at headquarters will be glad to receive orders for a single set or bulk orders. The cost per set, post free, is 9/3d.; 8/6d. for bulk orders.

OFFPRINTS AVAILABLE TO MEMBERS

A limited number of offprints of an article by Professor H. J. Fleure, " Some Environmental Factors and Features of Mediterranean Civilization," published in the *Bulletin de la Société Royale de Géographie d'Egypte*, Tome XXIII, June, 1950, has been made available to members. These offprints may be purchased at 1/6d. each, post free.

THE SEVENTEENTH INTERNATIONAL GEOGRAPHICAL CONGRESS, WASHINGTON, D.C., AUGUST, 1952; INTERNATIONAL GEOGRAPHICAL UNION

Plans for the 17th International Congress of the I.G.U. are now approved and well under way. The Congress is to meet at Washington, U.S.A., from August 8th–15th, and it will be preceded and followed by long excursions. A transcontinental excursion of a month's duration, from August 17th to September 13th, will be led by Dr. I. Leighley (University of California); a New England excursion by Dr. D. S. Whittlesey (Harvard) from July 27th–August 3rd; a Southern excursion, from July 27th–August 3rd, and August 17th–24th, by Dr. H. Miller and Dr. J. Russell Whitaker; and an industrial areas excursion from July 27th–August 3rd and August 17th–24th, by Dr. H. Mayo and Dr. Lester Klimm.

The National Committee has issued a formal call for papers to be contributed to the Congress, in all branches of the subject; a Programme Committee will select and assign these to the various sections. Papers and their abstracts must be submitted to the Chairman of the National Committee of the United States before February 15th, 1952. The abstracts must be submitted in either French or English, and should be limited to 400 words; complete papers should not exceed 2,500 words, only ten or twenty minutes being allotted for their presentation.

All arrangements for British Geographers to attend the Congress will be centralised through the British National Committee for Geography at the Royal Society, and geographers intending to submit a paper or to go to the Congress are invited to inform the Assistant Secretary, Dr. D. C. Martin, The Royal Society, Burlington House, London, W.1, as soon as possible. The submission of proposals for papers should be made as soon as possible.

VACATION COURSES IN METEOROLOGY

In view of the outstanding success of the pioneer course at Malham Tarn Field Centre last year, the Executive Committee of the Council for the Promotion of Field Studies and the Council of the Royal Meteorological Society have formed a Joint Committee to arrange regular courses in Meteorology.

The courses this year will be held at Malham Tarn Field Centre, near Settle, Yorkshire, from September 5th–19th, 1951, (divided into two periods, September 5th–12th and September 12th–19th), Course 'A,' and at Juniper Hall Field Centre, near Dorking, Surrey, from September 5th–12th, 1951, Course 'B.' It is intended that at the Malham course, the physical basis of meteorology should be studied with especial reference to current weather. During the second week, time will be mainly devoted to methods used in forecasting from synoptic and observational information. Students will be encouraged to plot charts, take their own readings and, it is hoped, that towards the end of their course they will be in a position to attempt their own analyses of weather maps. At Juniper Hall, the physical basis of meteorology will be outlined in somewhat less detail and emphasis will be laid chiefly on the construction of weather maps and the interpretation of data concerning climatic records and exercise in observations of as many kinds as possible.

At both centres, there will be discussions arranged in the evenings, both on aspects of weather study and on the application of meteorology and climatology to other natural phenomena and to geographical and economic considerations. Instruction will be given in instrumental work and in choosing a site for setting up a meteorological station. The current weather will be closely followed and constantly discussed, and will, in fact, be the focus of the courses.

The inclusive cost of each course will be £6 10s. 0d. per week. Forms of application may be obtained from the Director, Council for the Promotion of Field Studies, 10, Exhibition Road, South Kensington, London, S.W.7. (KENsington 8806). Applications should be made as soon as possible as the number of places is limited.

THERE IS A *world* OF TRUTH IN

REAL GEOGRAPHY

By James Fairgrieve, M.A. and Ernest Young, B.Sc.

Each chapter deals with a particular REAL place. Generalisations are made only after a particular place has been studied. The pictures are REAL photographs, many of which were taken specially for the books, and the "Work to be done," at the end of each chapter, comprises questions which are intended to encourage REAL reading and learning. While the arrangement and general treatment are regional, opportunity is taken to deal with physical and regional geography.

Book I.	**South America, Australia, New Zealand**	**5s. 0d.**
Book II.	**North America**	**5s. 0d.**
Book III.	**Africa and Southern Europe**	**5s. 0d.**
Book IV.	**Asia**	**5s. 0d.**
Book V.	**Europe** (*Just published*)	**5s. 0d.**
Book VI.	**The British Isles** (*Ready shortly*)	

Write for inspection copies

WELL PRODUCED ATTRACTIVE STRONGLY BOUND

George Philip & Son Ltd. 32 FLEET STREET, LONDON, E.C.4.

Dr. ACCUMULATED FUND—INCOME AND EXPENDITURE ACCOUNT. Year ended 31st December, 1950. Cr.

1949 £		£	s.	d.	£	s.	d.
	To *Geography*—						
788	Printing and Publishing.. ..	847	0	2			
29	Blocks	52	14	3			
87	Postage	84	17	10			
904					984	12	3
	,, *Geography in the Primary School*—						
	Printing and Publishing.. ..	58	15	0			
	Less Stock on hand 31st December, 1950	26	10	0			
—					32	5	0
149	,, Printing and Stationery				168	8	3
20	,, Addressograph				18	8	11
9	,, Insurance				8	10	0
800	,, Salaries and National Insurance				686	8	8
94	,, Postage—General				77	14	1
22	,, Sundry Office Expenses				20	17	11
15	,, Library Expenses				20	12	4
10	,, Telephone				9	8	9
9	,, Bank Charges				9	3	0
118	,, Officers and Standing Committee Expenses ..				170	3	9
10	,, Non-Recurring Grants to Branches				—		
3	,, Donations and Subscriptions				1	16	0
30	,, Accountancy Charges				30	0	0
44	,, Subventions to Branches				34	14	0
186	,, Balance, being Surplus for the year carried to Accumulated Fund				—		
£2,423					£2,273	2	11

1949 £		£	s.	d.	£	s.	d.
296	By Sales of Publications, etc., and Royalty ..				182	13	10
—	,, Sales of *Geography* in the Primary School				82	12	0
317	,, Advertisements				301	11	11
6	,, Surplus on Summer School				—		
22	,, Returned Library Postages				13	1	9
8	,, Closed Branches—Surplus Funds				1	1	0
	,, *Subscriptions*—						
	Current	1,472	0	6			
	Arrears	5	0	0			
1,607					1,477	0	6
	,, Interest on Investments and Building Society Deposits (including Investments & Deposits held in Life Membership and Jubilee Funds)—						
	On Investments (gross)	94	1	8			
	On Building Society Deposits	24	16	4			
123					118	18	0
44	,, Surplus on Annual Conference				52	16	0
—	,, Gifts				—		
—	,, Balance, being Deficiency for the year carried to Accumulated Fund				43	7	11
£2,423					£2,273	2	11

Dr. MISCELLANEOUS MAP SALES INCOME AND EXPENDITURE ACCOUNT. Year ended 31st December, 1950. Cr.

£		£	s.	d.
85	To Stock at 31st December, 1949	562	14	3
710	,, Maps, and Pictures Purchased	108	11	4
40	,, Stationery and Packing	9	9	3
44	,, Postages, Sundry Expenses, etc.	11	8	7
116	,, Balance, being Surplus for the year carried to Publication Reserve Fund	—		
£995		£692	3	5

£		£	s.	d.
420	By Sales	327	8	11
563	,, Stock at 31st December, 1950	362	0	0
12	,, Building Society Interest	1	17	1
—	,, Balance, being Deficiency for the year, carried to Publication Reserve Fund	0	17	5
£995		£692	3	5

BALANCE SHEET.

THE GEOGRAPHICAL ASSOCIATION.

31st December, 1950.

1949 £			£ s. d.	£ s. d.
	ACCUMULATED FUND			
	Balance at 31st December, 1949 ..		679 16 0	
	Deduct Deficiency as per Income and Expenditure Account for the year ended 31st December, 1950 ..		43 7 11	
			636 8 1	
	Deduct Income of the Herbertson Memorial Fund for the years ended 31st Dec. 1948 and 1949 credited to Accumulated Fund		15 9 10	
			620 18 3	
	Add Transfer from Jubilee Fund	87 6 1		
	Add Transfer from Life Membership Subscription Fund ..	170 0 0		
			257 6 1	
			878 4 4	
	Deduct Expenses of Removal & Installation	767 8 11		
	Deduct Special Library Expenses : Rebinding, Purchases, etc.	60 0 0		
			827 8 11	
679				50 15 5
314	SUBSCRIPTIONS PAID IN ADVANCE			233 6 3
365	SUNDRY CREDITORS			624 6 3
1,358	Per Contra			908 7 11
	PUBLICATION RESERVE FUND			
	Balance at 31st December, 1949 ..		940 19 1	
	Deduct Deficiency as per Miscellaneous Map Sales Income and Expenditure Account for the year ended 31st December, 1950 ..		0 17 5	
941	Per Contra			940 1 8
£2,299	Carried forward			£1,848 9 7

1949 £			£ s. d.	£ s. d.
	ACCUMULATED FUND			
109	Sundry Debtors		116 13 10	
—	Stock		26 10 0	
19	Income Tax Recoverable		19 13 8	
	Investments at par—			
	£200 3% Savings Bonds 1965/75 ..	200 0 0		
	£170 3% Defence Bonds	170 0 0		
200			370 0 0	
	(Market Value 31st December, 1950, £358)			
	Cash in hand		4 8 4	
	CASH AT BUILDING SOCIETY & AT BANK			
	Cash at Building Soc.	397 9 10		
	Less Overdraft at Bank	26 7 9		
1,030			371 2 1	
	Note—No Value has been placed on Stocks of "Local Studies" or Periodicals.			
1,358	Per Contra			908 7 11
	PUBLICATION RESERVE FUND			
32	Duplicator		32 3 2	
563	Stock		362 0 0	
43	Sundry Debtors		23 2 1	
303	Cash at Building Society		522 16 5	
941	Per Contra			940 1 8
£2,299	Carried forward			£1,848 9 7

BALANCE SHEET *continued.*

THE GEOGRAPHICAL ASSOCIATION

31st December, 1950

1949 £		£	s.	d.	£	s.	d.
2,299	Brought forward				1,848	9	7
	LIFE MEMBERSHIP SUBSCRIPTION FUND						
	Balance at 31st December, 1949 ..	2,182	3	3			
	Add Subscriptions received during the year ended 31st Dec., 1950 ..	17	0	0			
		2,199	3	3			
	Deduct Transfer to Accumulated Fund (3% Defence Bonds)	170	0	0			
2,182	Per Contra				2,029	3	3
	JUBILEE FUND						
	Balance at 31st December, 1949 ..	907	6	1			
	Deduct Transfer to Accumulated Fund (Building Society Balance)	87	6	1			
907	Per Contra				820	0	0
	HERBERTSON MEMORIAL FUND						
	Balance at 31st December, 1949 ..	259	2	0			
	Add Income for the year ended 31st December 1950	7	14	0			
		266	16	0			
	Add Income for the years ended 31st Dec. 1948 and 1949 transferred from Accumulated Fund ..	15	9	10			
259	Per Contra				282	5	10
£5,647					£4,979	18	8

1949 £		£	s.	d.	£	s.	d.
2,299	Brought forward				1,848	9	7
	LIFE MEMBERSHIP SUBSCRIPTION FUND						
	Investments at par—						
	£1,646 4s. 2d. 3% Savings Bonds, 1965/75	1,646	4	2			
	£300 3% Savings Bonds, 1955/65 ..	300	0	0			
2,116		1,946	4	2			
	(Market Value 31st December, 1950, £1,844)						
66	Cash at Building Society	82	19	1			
2,182	Per Contra				2,029	3	3
	JUBILEE FUND						
	Investment at par—						
907	£820 3% Savings Bonds 1965/75 Per Contra ..				820	0	0
	(Market Value at 31st December, 1950, £771).						
	HERBERTSON MEMORIAL FUND						
	Investment at par—						
250	£250 3% Savings Bonds, 1965/75	250	0	0			
	(Market Value at 31st December, 1950, £235)						
9	Cash at Building Society	32	5	10			
259	Per Contra				282	5	10
£5,647					£4,979	18	8

We have audited the Balance Sheet of the Geographical Association, dated 31st December, 1950, as above set forth, and certify that in our opinion it is properly drawn up so as to exhibit a true and correct view of the position of the Association as at that date, according to the best of our information and the explanations given to us, and as shown by the books.

March, 1951

SIR W. N. HIMBURY,
Hon. Treasurer.

HOLMES, WIDLAKE & GIBSON,
Chartered Accountants,
SHEFFIELD.

REVIEWS OF BOOKS

Members of the Library should know that, with very rare exceptions, books reviewed in this journal may be borrowed from the Association's library.

Geography in the Twentieth Century. Griffith Taylor (Ed.). 15 × 22·2 cm. x + 630 pp. London: Methuen & Co. Ltd. 1951. 30/-.

This important book consists of twenty-five chapters, five of them written by the Editor, making nearly one quarter of the whole, and the remainder by Americans, Englishmen, Canadians and Slavs. It is divided into three parts, Evolution of Geography and its Philosophical basis, the Environment as a Factor, and Special Fields of Geography. There are fifty maps and diagrams, some of them too small to be of much use and very crude, and there is a ' Concise Glossary of Geographical Terms ' by the Editor (Chapter XXVI). The book sets out to give an account of " the growth, fields, techniques, aims, and trends " of geography. It must therefore be judged by its treatment of those five topics.

The " growth " of geography is treated inadequately. The reader may ignore the useless diagram (Fig. 1) purporting to show " the ramifications of modern geography since 1700," partly because it is inaccurate and misleading, and partly because it represents merely the ideas of one geographer. He will find in Chapter II a somewhat superficial account of the growth of geography from 550 B.C. to the time of Humboldt and Ritter, occupying fourteen out of forty one pages. Its writer, Dr. Tatham, then passes to what is left of the nineteenth century, giving most of his space to the German geographers and leaving less, than two pages for others. He does less than justice to Elisée Reclus and says nothing of those French scholars who, as Gallois showed nearly fifty years ago, were giving much thought to the problems of regional geography in the early part of the century. Nor is it correct to say that ' University Geography in Britain began in 1887.' In Oxford, in Cambridge and in London, Geography was taught long before that date.

Some of the deficiencies of this chapter are remedied by the excellent contribution of Dr. Harrison Church who writes with insight and knowledge on the French School of Geography. Professor Van Valkenburg is less successful in his treatment of German geography which is inadequate in so far as the period before Hitler is concerned and strongly prejudiced thereafter. Chapter V on West Slav geographers might well have been omitted. The contributions of Czechoslovakia and Poland were not, of themselves,. of outstanding importance and do not deserve a place when those from other countries such as Italy are omitted.

Particular aspects of the growth of geography follow. Dr. Tatham supplements his earlier chapter by a discussion of Environmentalism and Possibilism. His historical summary is useful but when he comes to examine the ' Stop-and-Go ' determinism of Professor Griffith Taylor his arguments become illogical and weak. The next two chapters are of real value and of great interest. Professor Wooldridge has too little space to deal at length with the progress of Geomorphology but all that he says is relevant and worth saying. Similarly Professor Hare gives an admirable account of the most recent developments in Meteorology in so far as they concern geographers. Dr. Putnam, in Chapter X, contributes a useful and scholarly account of soils and their geographical significance, and the Editor writes of the exploration of the Antarctic in the nineteenth and twentieth centuries, thus covering " the last years of world exploration."

So much for " growth." The " fields " of geography are likewise represented in partial fashion. Perhaps Professor Visher's chapter (IX) on Climatic Influences comes under this head. It certainly departs from the historical pattern and in places borders on the obvious as in " Some effects of Torrential Rain " which are said to damage buildings by " flooding of basements and weakening of foundations by run-off and by water soaking." Bowman's chapter on Pioneer Settlement, that by Dr. Washburn on Arctic Lands, and that by Dr. Pelzer on the Tropics obviously cover " fields " of geography, and provide valuable information at the same time. They all come under the general heading of ' the Environment as a factor,' a misleading title since not all types of environment are represented in this section.

Perhaps, too, the Editor's contribution on Urban Geography should be included here though few will agree that his treatment of this difficult subject is sound. It is largely a recapitulation of views set out in his book of the same title.

Part three proposes to deal with " Special fields " of geography. It includes some topics which are not special " fields " but are general matters of interest to geographers. Thus the informative essay by Dr. Wright deals with the history and function of geographical societies, that of Dr. J. K. Rose with the employment of geographers in the Federal Government of the United States, and that of Dr. Putnam with Geography as a practical subject: this last essay also includes something of the ' technique ' of practical geography. For the rest the Editor repeats his controversial ideas of racial geography, and Professor Fawcett contributes a disappointing chapter on Geography and Empire as an example of modern Political Geography. Professor Watson writes on the Sociological aspect of Geography, in which he includes a discussion of natural regions and functional regions. He is not particularly convincing when dealing with principles, and this chapter overlaps to some extent that of Mr. Gilbert on Regionalism which appears earlier in the book, although the regionalism of the latter seems to be concerned chiefly with selecting the right political sub-divisions within a state while that of the former is occupied with identifying different regions " according to association of social phenomena related to the total environment." Professor Stamp, who provides a factual account of the history of the Land utilisation Survey of Britain (though doing less than justice to the part played by himself) adds yet another series of regions, ten types of land in Britain as a basis for physical planning. Finally among the " fields " of geography is Ellsworth Huntington's paper, first printed in 1947, on Geography and Aviation. Among his conclusions, most of which had been reached by others before 1947, is the interesting view that "Aviation will not change a single basic principle of geography, but it will bring new applications of old principles."

" Trends " of geography are mainly dealt with by the editor himself, or may be inferred from remarks of others. In Chapter I we are told that in modern geography there has been a " shift from exploration to urban patterns." A vague sentence at the top of p. 600 tells the reader that before 1914 . . . " not much interest was taken in a number of branches of geography which have become relatively popular in recent years " but does not say what these latter are. Cultural geography appears to be one, and geopacifics another—the latter summarising all that Professor Griffith Taylor has been trying to teach since 1917. " It shows that we should study environmental control, so as to advance in harmony with our environment. It is a material philosophy, but not a complete one, because it does not pretend to discuss those basic principles which properly belong to distinct *ethical* disciplines."

And so we come to " aims." What are geographers trying to do ? Here the book gives little help. Professor Watson tells us what geography is *not*—not the mere account of distributions and not the gathering of data on distributions—and what it may be : ' geography is the science of landscapes, or the science of environmental control, or the science of distributions, or the science of regional differentiation.' He also quotes with approval Mr. Handyside's view that ' geography is not so much a study or a branch of study as an attitude to, a way of thinking about, certain phenomena.' To Mr. Gilbert it is ' the art of recognizing and describing the personalities of regions.' Dr. Putnam claims that it is primarily a field study of observation, recording and interpretation, the actual methods " depending upon the type of area involved, the objectives and purposes to be served, the equipment and the personnel available." The three types of area are natural, rural and urban. The editor declares that Geography is concerned primarily with distributions, that it is a liaison subject, that 'forecasting settlement' is of increasing importance in the work of the modern geographer, and that the ' geocratic ' attitude " most closely characterises our discipline." But when we " get down to brass tacks " (the phrase is the editor's) we learn from Dr. Rose that the " student who anticipates Federal employment rather than teaching should give special concern to specialization . . . the time has arrived when it will be highly desirable if not absolutely necessary for the student to decide whether he is to be an *economic* geographer, a *cartographer*, or a *physical* geographer . . . There is another possible specialization . . . that of regional or area specialist . . . The lot of the systematic geographer would seem to be somewhat happier. But there *are* regional geographers," though as an " area specialist " a geographer must become a real expert on the area and not merely an expert on its " academic geography."

Strange as it may seem, two of these specialist "fields," cartography and economic geography, find no place in this account of geography in the twentieth century. Nor do we read anywhere of the development, by geographers, of historical geography or the history of geography. Nor is there any adequate account of regional geography except in so far as it is treated historically. On the other hand there is a great deal of controversy that might have been left out. The general reader might suppose that geographers were constantly arguing the merits of determinism or possibilism. Fortunately in Britain at least this is not so. As has recently been said in another—and on the whole better—book dealing with geography as a subject of study, 'geography begins only when geographers begin writing it,' and British geographers at least can recognize what is geographical when they see or read it and are not unduly troubled by trends or aims or growth.

There are a number of irritating misprints or misquotations in footnotes which could have been avoided. Thus on page 310 Brown R should be Brown R. N. R., Heawood G. should be Heawood E. and Mills H. R. should be Mill H. R. The Scott Polar Research Institute, Cambridge is wrongly named, and four well known authors have been given no initials. Twice (p. 172 and 176) the Inst. British Geography is referred to, and the footnote on p. 484 should refer to Geog. Jour. Vol. CIX p. 288 and not Oct. 1947 its date of publication. On page 608, the work *An Historical Geography of England before* 1800 is wrongly stated to have been published at Oxford, and Mackinder's "famous book" *Democratic Ideals and Reality* was first published in 1919 and not in 1917. On page 418 Bowman's *New World* is said to be published in 1912 and on page 466 the reference to la Blache's *The Personality of France* makes it appear as if it was a separate work and not a translation of part of his famous *Tableau de la Géographie de la France*.

The most serious objection must be taken to chapter XXVI which is "A concise glossary of Geographical Terms" by the Editor. Some of these are elementary as 'Anthracite: type of hard coal' or 'Cloudburst: exceptionally heavy rain' or 'Lagoons: shallow lakes on shores,' or 'White Australia: a ruling which prevents coolie immigration.' Many are terms invented by Professor Griffith Taylor and unrecognized by other geographers. But if this list really shows, as its compiler claims, 'that geography has a nomenclature whose scope is similar to that of other natural sciences' then the sooner the geographers abandon it and stick to plain English the better for their reputation and the better for the subject.

All geographers should read this book despite its defects. The story of *Geography in the Twentieth Century* is worth telling, and could be told much better than it has been told here, but there is plenty of good material in this work and more than enough to stimulate thought and provoke discussion. The Editor makes big claims for Geography as "the discipline which can instruct mankind objectively and visually as to the problems of our troubled world.' If it is to fulfil this function geographers must learn first to discipline themselves.

J.N.L.B.

London Essays in Geography: Rodwell Jones' Memorial Volume.
L. Dudley Stamp and S. W. Wooldridge, Editors. 15·5 × 23 cm. xiv + 351 pp. London: Longmans, Green & Co. Ltd. 1951. 25/–.

This volume of essays, published in honour of the memory of Professor Rodwell Jones, is a fitting tribute to one of the pioneers of the Joint School of Geography at King's College and the London School of Economics, and a proof of the vitality and variety of its work since its inception in 1922. A brief editorial account of the Joint School by Dr. Stamp and Dr. Wooldridge, showing Rodwell Jones' part in it, is followed by valuable essays by the editors in the fields which they have made peculiarly their own—national planning and geomorphology. It is impossible in a short space to do justice to the fifteen interesting papers which follow. Historical and economic geography are well to the fore. They range in time from "Africa in Ancient Times," by Dr. H. J. Wood to Professor Buchanan's "Air Transport: some Preliminary Considerations," and in space from Dr. Crowe's "Rainfall Régime in the South-Eastern United States" to S. W. E. Vince's "The Agricultural Regions of Belgium." Historical economic geography is represented by Mr. O'Dell's study of "A Century of Coal Transport" in Scotland, Dr. Lebon's "The Beginning of the Agrarian and Industrial Revolutions in Ayrshire" and Professor East's account of "The Severn Waterway in the 18th and 19th Centuries." Dr. Willatts writes on Land-Use Planning, Kenneth Hare on Climatic Classification, Dr. Kimble on The Inadequacy of the

Regional Concept, Dr. Pounds on Geographic Factors in the Exploitation of Minerals, Dr. Harrison-Church on Trans-Saharan Railway Projects and F. G. Morris on Some Aspects of the Rural Settlement of New England in Colonial Times. Professor Linton's discussion of The Delimitation of Morphological Regions deserves special mention for the value of its contents and the clarity of its exposition. Some of the other essays are marred by jargon and the over-frequent use of inverted commas. The production of the book calls for some criticism : misprints are unusually frequent and, what is more serious, the maps are in many cases difficult to read, whether from over-reduction, poor quality paper or over-heavy lettering. Internal evidence shows that the essays were written some years ago, but this is certainly a book which every geographer will want to possess. E.E.E.

The Spirit and Purpose of Geography. S. W. Wooldridge and W. G. East. 13 × 19·25 cm. 176 pp. London : Hutchinson's University Library. 1951. 7/6.

This is a lively and broadminded study of our subject by two active thinkers who have approached it from the physical and the humanist side respectively, and are in sufficient agreement to write jointly. For them geography is not so much a defined field of study as a wide ranging effort from a certain point of view. In the matter of that point of view they recognise that the era inaugurated by Lyell and Darwin marked a great change in thought, and that our interpretations should be genetic, dynamic rather than static. At the same time they emphasise our primary interest in things as they now are. The importance of geomorphology is determinedly u ged and it is rightly expounded as including not only interpretation of the evolution of landforms but also the study of soils and other matters. The references to climate and weather are not as good on the whole, but we know that meteorology has just been passing through a transition in ideas and the situation needs time for further clarification.

Darwin's basic thought was the interaction between living things and their environments as altering both, and this gives the basis of the claim for geography in a general education as well as for it as a subject of research. The reviewer regrets that the authors in one or two places seem to imply that social geography and human geography are more or less interchangeable terms ; he would urge that the former is a portion but by no means the whole of the latter. H.J.F.

Modern Colonization. R. J. Harrison Church. 12·8 × 19 cm. 165 pp. London : Hutchinson's University Library. 1951. 7/6.

This book is interesting in approach and content. The author's object is to outline and illustrate the scope of Colonial Geography, which he defines in Demangeon's words as " the geographical aspects of the contact of different peoples associated by colonization." The distinctive feature is clearly that it is a study of a particular set of human contacts, and it is not surprising that its subject-matter is largely drawn from the tropical *colonies d'exploitation.* The great extra-tropical movements of population which the term " modern colonization " chiefly calls to mind, receive little mention, and it seems the book has been given a misleading title. This is perhaps not a great matter, nor are other criticisms that might be made. Dr. Church has not always managed to preserve the strict standpoint of his definition. His justifiable advocacy of the practical value of the subject makes him under-estimate the total of work already done, quite in the spirit of his own. The collector of jargon will be pleased to meet " interfluve " and " siltation." But there is solid worth in the up-to-date and interesting detail on African colonies, the wealth of illustration from French sources, the informed analysis of the whole subject of colonial contacts, and the clear demonstration of the rôle of the geographer in colonial affairs. G.L.

The Study of Geography. J. M. Mogey. 10·5 × 17 cm. 164 pp. London : Oxford University Press. 1950. 5/–.

In this little book written for the Home University Library, Dr. Mogey gives us a comprehensive statement of the subject, of both physical and human geography, of both the whole compass of the world and the precise field analysis of a small area. The reader is rightly left in no doubt of the wide ranging character of geography. Within this compass, the treatment of the physical geography is the weakest part of the book : there is some unjustified talking down to the layman and an occasional out-of-date assertion. There are a few inaccuracies, or apparent inaccuracies, elsewhere. The analysis of human societies in relation to the land is the best part of the book and this will prove most stimulating to the general reader. Dr. Mogey does not attempt to discuss the method of geography except in the form of an occasional pregnant sentence. Nor does he discuss the nature of geography at any length : though he evidently conceives of geography as being concerned with landscape and with distribution patterns, it is the relations between man and his habitat that in Dr. Mogey's mind constitute the core of the subject. A full-scale discussion of these issues, however, would be out of place in an introduction designed, at any rate in part, for the layman, for such a reader could not have that familiarity with specific pieces of geographical analysis and synthesis essential to understand and appreciate geographical theory. Dr. Mogey has produced a workmanlike volume which, although not as consistently stimulating nor as lucid as Dr. Marion Newbigin's *Modern Geography* in the same series, will serve, after making allowances for inequality of treatment as a not inadequate introduction to the subject for a generation younger than that which read Dr. Newbigin with so much profit. W.S.

Southeast Asia. E. H. G. Dobby. 21 × 14 cms. 415 pp. London : The University of London Press. 1950. 18/–.

Of all monsoon Asia, it is the countries situated between India and the Far East that have received least attention from geographers and about which least is known. Consequently Professor Dobby's book, covering the area from Burma to the Philippine Islands and from Indo-China to the East Indies, fills a very real gap in the regional literature of our subject.

As Professor Dobby states in his preface, the book is divided into three parts. " The first pictures the natural setting, the second goes from this basis into the human details of each political unit, and the third ties together the social geography of Southeast Asia, to pose some of its present problems." Part I, entitled " The Natural Landscape of Southeast Asia " and compr sing the first five chapters, is concerned with various aspects of the physical environment for the region as a whole. These five chapters are devoted to the natural landscape (which term is here used to include structural and tectonic features of both land and sea areas, rock types, tides and corals), climatic factors, drainage patterns (including such topics as the characteristics of tropical rivers, sedimentation and floods), natural vegetation (including a short section on the fauna), and soils. The second part, on " The Countries of Southeast Asia," does much more than merely go into the human details of each political unit. The geography of each country is treated in turn from the viewpoint of the natural landscape, the cultural landscape and the social geography. For the more important a separate chapter is devoted to each of these three aspects, while for countries of lesser importance all three are compressed into one chapter.

This arrangement having been adopted, it seems highly illogical, however, that Part III, " The Human Geography of Southeast Asia," should come after the regional section. Certainly the first three chapters in this section (on agriculture, fisheries, and industry and trade) stand in precisely the same relationship to the regional chapters as do those in Part I that are concerned with the natural landscape. The general plan of the book would have been greatly improved if most of Part III had been inserted between Parts I and II, and if one concluding chapter had then been devoted to a summing up of the problems and prospects of south-east Asia.

It is not only in its general plan, however, that this book does not follow a logical sequence. Thus in the chapter on the Philippine Islands, the section on United States influence, which is considered especially in relation to agriculture, is sandwiched in between " Commercial Crops " and " Sugar." Consideration of overseas (especially Spanish) influence, on the other hand, follows the sections on population patterns and the composition of the population.

A most useful feature of this book is the bibliography. Each chapter or, in the case of Part II, each country is given a separate list. The serious student would, however, have found the bibliography of greater value if some indication had been given of the relative importance of the works listed. Furthermore, it is very greatly to be regretted that, in the text, sources have not been acknowledged, except for an occasional name (without even initials) inserted in brackets in the text itself. There is not, incidentally, one single footnote in all the 398 pages of text, though there are innumerable instances where matter in the text could very much better have been relegated to the foot of the page.

The most serious indictment of this book, however, must be on the grounds that it is extremely difficult to read. This is due to bad and even incorrect syntax. It is possible to puzzle out the meaning of most sentences, but most pages contain long and involved phrases that greatly tax the patience of the reader. One example must suffice. Thus, in discussing that portion of the Irrawaddy between Katha and Mandalay, it is stated, " Chief focus of the Burmese people and their tradition, Mandalay is clearly located as a convergence centre and dominating point for human movements in the Chindwin-Irrawaddy-Sittang valleys, and from the valleys through the Shan country."

Though this work is not free from misprints, even more irritating is the use of incorrect or variant forms of certain geographical terms. Thus " peneplanation " is given as " peneplainisation", " estuarine " as " estuarial." And such a term as " eulittoral", borrowed from the biologists, should certainly have been defined when first used. Furthermore, where botanical names are given (and they very rarely are given in full) they are not recorded in the generally accepted manner.

The maps and diagrams are very disappointing. Though the idea behind many of them is undoubtedly good, they are cartographically poor. Fault can be found with approximately one-third of them. Some are incomplete, some include irrelevant features, some have no scale, in some the emphasis is unfortunate, in some the map and key do not agree, some are just badly set out. A few examples may be given to substantiate these criticisms. Two chapters deal with Java and Madura and yet the five maps for this area all omit Madura. There is a map of river capture in Central Malaya, yet one of the chief features shown is *forested* land above 150 feet (reviewer's italics). The key in the vegetation map of Burma does not agree with the map. The map showing the pattern of languages in south-east Asia could have been useful had it been drawn on a larger scale ; as it is, though Chinese is mentioned in the key it does not appear to be spoken in any area shown on the map—not even in Singapore ! Lastly, the figure showing Köppen's climatic regions of south-east Asia, is a very good example of how not to set out a map.

Finally, it must be stated that this book, for all its faults (and they are many) is nevertheless still a valuable text-book. While in no sense a scholarly work, it contains a great deal of very useful information about south-east Asia and no student of this area can afford to neglect it. It is a great pity, however, that the most fundamental word in the whole book is given, not in its correct form of " south-east," but as " southeast," a form unrecognised by the New English Dictionary.

I.S.M.

The Soviet Union. Georges Jorré. 14 × 22·3 cm. xviii + 353 pp. London : Longmans Green & Co., Ltd. 1950. 21/–.

The original edition of this work was first published in Paris in 1946 and the contents are now made available for a much wider circle in the English-speaking countries. The translation has been carried out with the consummate skill that one has come to expect from E. D. Laborde. The general treatment of the subject is quite traditional, about one-sixth of the book is occupied by a brief account of the physical setting. This is followed by an equally brief survey of the expansion of the Russian world. The remaining sections describe the Soviet economic system—agriculture, industry, transport and commerce—and the main sub-divisions of the country.

Geographical literature on the U.S.S.R. has never been abundant for either school, college or university and therefore a new account of this " agricultural colossus and industrial giant " is always welcome. On the other hand, it is rather disappointing to find that this new book by M. Jorré adds but little to our general knowledge of the Soviet Union already gleaned from books of similar scope. Although the author has brought his original edition up-to-date the statistical picture is largely that of 1939.

M. Jorré asserts in his conclusion that the geographer should not pass judgment on political and social changes and yet there are occasions when the reader will have some doubts in knowing the precise period to which certain graphic descriptions should be referred, for example, " the strong stench of the *Izba*, in which are mingled stale odours of the smell of dust, smoke, breath, filth, dried sweat, urine and excreta is something to write home about ! " In this connection it is unfortunate that the original bibliography has been omitted from the English edition. Several factual mistakes have been made, e.g. on p. 129 the acreage under cereals should read 250 million acres instead of 2½ million acres, and the yield of 30 bushels per acre for wheat seems a high figure even for the Ukraine.

G.D.B.G.

A History of the Isle of Man. R. H. Kinvig. 14·5 × 22·25 cm. 180 pp. Liverpool: University Press of Liverpool. 1950. 7/6.

This is a new edition of an important book on the Isle of Man which was first published in 1944. The new version includes several additions to the text more particularly related to the earliest and latest phases of Manx history. On the one hand Professor Kinvig has included the results of Dr. Gerhard Bersu's important excavations of the Celtic homesteads in the Isle of Man published after 1945, while on the other, he has described the events that led up to the formation of the Executive Council of Tynwald in 1946, and at the same time sketched the modern economic, social and cultural progress of the island. There is also the addition of a most valuable glossary of 177 words that are most often found in Manx place names complete with the Manx form, the English equivalent and examples of their usage. Nevertheless, it is not in this technical sense, nor in the constitutional, administrative and military sense that Professor Kinvig envisages the history of the island. He is concerned primarily with social history, and, particularly, the manner in which this social history is related to the physical and cultural environment of the island. That is why we have such excellent opening chapters on the physical and human background and on prehistoric times. The theme is maintained throughout, as for example in such interesting sub-headings as that entitled " How the People Lived " on page 118 of Chapter XI where we have a vivid description of conditions during the 17th and 18th centuries. It is precisely for this reason also that Professor Kinvig's book constitutes an important contribution to human and historical geography as well as to history as such. It should be read by all students of the historical geography of Britain, and especially by those who claim any knowledge of the physical and cultural geography of Highland Britain. The volume is excellently produced with a pleasant format, excellent illustrations amounting to over fifty maps and pictures. The former are well drawn and informative. The latter are clearly printed and placed, for the most part, on art paper which, in these days, must be considered a real luxury. The volume has an index, and there is a well selected bibliography at the end of each chapter. E.G.B.

The Face of Wales (The Face of Britain Series). T. Edwards. 13·5 × 21 cm. vii + 120 pp. London: B. T. Batsford, Ltd. 1950. 12/6.

This is one of the series of Batsford books on The Face of Britain, and it is clear that the volume fully maintains the very high standard of the series. From the point of view of the professional geographer these books are most valuable as ' background ' studies, giving the teacher a wealth of historical anecdotes and illustrative matter. They are necessarily limited by the way in which they deliberately avoid the ugly and the unpleasant. This volume avoids the Rhondda valleys and the industrialised regions of both north and south Wales, and concentrates on all that is most distinctive in the buildings and scenery of the Principality. We have much of what has remained of Regency architecture in our towns, and many remarkable screens in our parish churches. The medieval castles and the 18th century homes of the squirearchy also figure largely. It would, however, be unfair to suggest that the physical background is entirely ignored. It contributes much to the natural beauty of the countryside and some of the pictures, particularly of the Snowdon country, are very beautiful and well selected. Several, including Figs. 2, 26 and 30, could be used with great advantage for scientific work. A good teacher could also use this book with great effect to teach historical geography. The picture of Caernarvon showing the castle and the medieval street-plan inside the walls, Fig. 85, deserves special mention as a most valuable aid to the understanding of medieval town planning. There is, of course, much that can be criticised, especially the spelling of Welsh names and the curious fact that although the book was first published in the spring of 1950 much of it was then over 15 years out of date. We read on page 31 of bits of the 13th century work of Carmarthen castle peeping from behind the late Georgian facade of a county gaol, no longer functional, built by John Nash ; the county gaol has, since before the Second World War, been not only no longer functional but no longer existent, being replaced by new county administrative buildings. It would, however, be ungracious to end a review of this kind on a note of criticism. The book is good and beautifully illustrated, suitable for the general reader, and could be used in school for illustrative purposes with considerable advantage. There is an index, and there are outline maps on the cover boards. E.G.B.

The Industrial Development of South Wales. 1750–1850. A. H. John. 15 × 22·5 cm. ix + 201 pp. Cardiff: University of Wales Press. 1950. 12/6.

This essay in economic history deals with the earlier of the two stages in the industrialisation of the South Wales coalfield; that is, with the period in which iron- and copper-smelting were the dominant industries, and in which pre-eminence had not passed to coal. It is a little unfortunate that the dates which roughly define this period, although printed on the title page, are not reproduced on the cover of the book, which therefore appears at first sight to cover a wider field than is really the case.

There is an introductory chapter on the "old order" of the South Wales of 1700–1750, which begins with a brief but reasonably adequate geographical section. The next three chapters deal respectively with the financing of industry, the development of a labour force, and the markets of the coalfield. The penultimate chapter is concerned with the technique of production in the smelting industries and in the mining of coal and iron ore, and is of particular interest to the geographer; the author, however, perhaps assumes too readily that his reader will have some knowledge of mining technique, while he is not very happy himself, it seems, when he is discussing metallurgical matters. Here, of course, the historian of industry meets the same difficulty as the economic geographer; both must know something of technology. The final chapter summarises the process of industrialisation in the period with which the author is concerned, with a number of glances forward to the next period. The book is illustrated with three maps, in the preparation of which the author wisely sought the counsel of geographers; the first, a simple relief map, is unexceptionable, but details on the other two (population maps for 1801 and 1851) could have been improved.

Good, original and well documented economic history is always of interest, and this book is all three. But it also specially commends itself to the geographer; it discusses the real reasons for the location and character of industrial and mining activity, and thus serves as a check on the reasons which are wont to be given in text books; it discusses (p. 98) the historical origins of the failure of secondary industries to take root in South Wales, a failure which has, of course, had very important consequences in our own times; and it provides examples of the ways in which, in competition between ports, arbitrary factors such as the exemption from coastwise duties enjoyed by Newport can make nonsense of apparent geographical advantages possessed by its rivals (pp. 117–118).

This book, then, is worthwhile and useful. It is a great pity that it is marred by careless proof-reading. An errata slip is included (in itself an unfortunate necessity) but it does not mention many of the mistakes, and itself makes another. There are also some infelicities of style, of which the phrase "a few but increasing number of industrial workers" may serve as an example. B.H.F.

Land Potential. T. W. Evans. 13·5 × 21 cm. 144 pp. London: Faber and Faber, Ltd. 1951. 12/6.

This is a book stored with knowledge and ripe with experience and wisdom. It is written by a scientist with twenty years of study of grassland management and farming. His views command attention and are directed in this volume to farmers, professional agricultural advisors and scientists, and to the educated public interested in the right use of the land. His theme is that soil and climate determine the amount of food that can be produced on a farm over a period of years, and that farm management should aim to produce at slightly less than this "land potential" so as to conserve and build fertility, which he rightly calls soil capital. If land is farmed year after year above this potential by use of food concentrates for over-stocking, artificial fertilisers to boost yields, etc., the soil structure will deteriorate and ultimately prove costly and difficult to restore. If it is farmed much below its potential it will be wasteful and uneconomic and land will deteriorate from neglect or fail to build in fertility. A formula is devised to estimate the land potential of each farm taken as a farming unit, the only true farming unit. From such results the farmer and adviser can modify the type or system of farming, the head of stock, and the flexibility of rotation systems to give a sustained optimum food production.

Each page and chapter carries the authentic feel of farming the land. The book is full of the practical farming knowledge which most town-bred teachers of geography have sought for years and it is advanced in method and thinking. The reading of it is sheer pleasure. A.D.

New Worlds Emerging. Earl Parker Hanson. 14 × 22·25 cm. xix + 385 pp. London : Victor Gollancz, Ltd. 1950. 16/-.

That we live today in a world which is not only shadowed by the fear of atomic warfare but also bright with emergent possibilities is the proposition of Professor Handon's latest book. And that the survival of the western world depends upon a courageous exploitation of this potential rather than upon its deliberate conservation, as Vogt suggested, is the conclusion of this engineer-prospector turned geographer, whose firsthand knowledge of the earth's frontier zones must be unrivalled.

The author contends that the Anglo-Saxons in general, and their geographers in particular, have allowed their *Weltanschauung* to be distorted by outworn concepts of the world outside their own latitudes. He attributes many of our beliefs regarding the habitability of the Arctic and the tropics to " the picturesque ancient habit of filling the unknown, or the little known, with monsters, dragons, and other perils conjured up by the popular mind." (p. 40). Speaking with the authority of one who has seen for himself, Professor Hanson denies the validity of such beliefs, and in this he will doubtless receive support from those many servicemen whose war experience included the discovery that they did not court certain death by merely venturing out of doors in the tropics without a sun-helmet. To the extent that geographers may be guilty of misrepresentation on this point—and Mr. Hanson is perhaps a little harsh—the book will serve as a corrective. However, it is likely to remain true that most people prefer, on rising in the morning, not to find scorpions in their shoes or snakes in the bathroom.

But there is another, more controversial, theme developed in the book which demands careful attention ; more careful, perhaps, than the author gives it. It is the contention that many of the evils of life among the peoples of the world's non-temperate zones are the product not so much of an unfavourable environment, and certainly not of innate social inferiority, as of the state of economic colonialism in which the majority of these peoples exist. On the effect of environment on a population, it is regrettable that Mr. Hanson creates the impression that no right thinking existed before Platt's paper, " Determinism in Geography," (*Annals of the Association of American Geographers*, Vol. 38, 1948, p. 126–132), important though that may have been. In support of his second denial, he could call in an increasingly long line of scholars, not only among the American negroes, and no harm will be done by striking one more blow at the fallacy of racial inequality for, as Gunnar Myrdal has reminded us, " it is the popular beliefs, and they only, which enter directly into the causal mechanism of inter-racial relations. (*An American Dilemma*, Harper, New York, 1944). But by his assertion that the miserable living conditions of many tropical native peoples represent the effects of colonial exploitation, or what he describes as " the habit of intrenched interests of opposing the development of frontier lands from whose frontier conditions they derive a profit," (p. 355) he brings to our attention a problem inviting the closest scrutiny from the geographer's standpoint. His evidence is calculated to impress and the reader will have to judge for himself whether Professor Hanson carries his point. If it be felt that he does so, he will have brought to light once more a fact of which geographers are growingly conscious—that simple geographical data have a habit of turning into moral issues in their hands. He will also, incidentally, have provided his own best refutation of that determinism which he so deplores, by depicting its exact antithesis—the restraint of a bountiful nature by the machinations of those creatures of whom Semple wrote " Man is a product of the earth's surface."

This book, as its author readily admits, is written to offset the " Neo-Malthusianism " of Vogt and others and is therefore intentionally challenging in tone. There are passages through which the spirit of Frederick Jackson Turner shines, and others more reminiscent of the chamber of commerce pamphleteer. However, in himself displaying in a modern setting the American frontier spirit, and in reminding geographers that they are in constant danger of becoming ridiculous by being academic, Professor Hanson performs lively service to the cause.

J.H.P.

Herdsmen and Hermits. T. C. Lethbridge. 12·6 × 19·1 cm. 146 pp. Cambridge : Bowes and Bowes. 1950. 10/6.

This is a delightful little book, telling the story of the waters of the North Atlantic and the men who sailed them during the three thousand years prior to the voyages of ' discovery ' in the 15th and 16th centuries A.D. The author is an archæologist who ardently believes that there is more to his subject than the classification of material artifacts in museums and that the men who made them their way of life, and their environmental problems are the real objectives in the study of the things they left behind. His Herdsmen are the stockbreeders of the Celtic west of Scotland with traditions reaching back to Neolithic times, and his Hermits the followers of early Celtic Christianity who voyaged in these northern waters in search of a 'desert' of contemplation. The main thesis of the work is that in the Celtic west of Britain, and especially among the 'crofters' and 'monks' of west and north Scotland, there was an early knowledge of the Northern Seas and Islands far in excess of that usually supposed, and that these Celtic folk both in person and navigational experience played a large part in the 'Norse' spread along the southern margins of Eskimo culture. Although, as the author admits himself, many of his theories are unproven and are really imaginative guesses, nevertheless he has provided a most interesting stimulus to further work on the problems of early migration in the north. Perhaps Mackinder's Celt sitting on 'the dark rocks and bird haunted skerries' listened to the waves rolling in from a sea area by no means unknown. W.K.

REVIEWS OF TEXT BOOKS

Europe. A. R. Barbour Simpson. 12·5 × 19 cm. xii + 257 pp. London: G. Bell & Sons, Ltd. 1950. 5/6.

With the publication of this volume on Europe, Mr. Simpson completes his Geography of the World. The earlier volumes were *The British Isles*, *Africa*, *The Americas*, *Australia—New Zealand*, and *Asia*. Whilst retaining as a framework the first proof stage of the book which was prepared for publication in 1939, but was suspended because of the unsettled state of Europe, Mr. Simpson has revised the original proof and has added some material such as a modern geography of Europe should contain. The method of arrangement will not perhaps commend itself to all teachers but the ground is covered adequately. The pictures are well selected and the maps carefully chosen so that they are not overcrowded with detail. The graphs of statistics, however, do not extend beyond 1937 and therefore refer to past rather than present trends. The book is suitable as a class textbook for the upper forms of secondary schools though occasionally the author's style is too involved and confused for comprehension by pupils using the book for private study. J.C.S.

Human Geographies. Fairgrieve & Young. Book I. The British Isles. iv. + pp. 252. 6/–. Book II. The Atlantic Hemisphere. pp. 295. 6/6. 12·3 × 19 cm. London: George Philip & Son, Ltd. 1950.

Ten years have elapsed since the 13th edition of Book I. The editors have taken the opportunity, provided by this new edition, of making a thorough revision and considerable alterations in text. Those who used and valued the earlier editions of this work will certainly not be disappointed in this. Such an up-to-date volume is an excellent text book for pupils studying the British Isles in the middle forms of secondary schools.

The publication of a 10th edition of Book II reflects the popularity of this series with past and present teachers of geography. The demand for these volumes, first published 28 years ago, continues, though the authors have not responded to the modern desire for photographic illustrations. The text and arrangement are substantially the same as in previous editions. An occasional emendation is made where a minor alteration in the text brings factual knowledge up-to-date and where it does nothing to upset the balance of the original. The book deals chiefly with human geography but physical aspects are not neglected, being treated sometimes as incidentals in the course of the regional studies and sometimes in separate chapters. Numerous sketch maps, mostly suitable for reproduction by pupils themselves, are a useful feature whilst the questions at the ends of the chapters are not only valuable as recapitulation exercises but call for intelligent application of geographical principles. J.C.S.

Geographical Articles in Magazines Received

CONTINUED FROM VOL. XXXVI, pp. 68 to 70.

A of G—Annals of the Association of American Geographers. BGB—Bulletin de la Société de Géographie de Beograd. BGSC—Bulletin of the Geological Society of China. COM—Cahiers d'Outre-Mer. EG—Economic Geography. Ed. G—Education Gazette, Cape of Good Hope. GA—Geografiska Annaler. GJ—Geographical Journal. GR—Geographical Review. GV—Geografski Vestnik. IA—International Affairs. JC—Journal of the Geographical Society of China. J of G—Journal of Geography. PE—Progress of Education. PG—Przeglad Geograficzny : Révue Polonaise de Géographie. PGA—Proceedings of the Geologists' Association. PGR—Pakistan Geographical Review. PO—Planning Outlook. RGI—Rivista Geografica Italiana. S—Sankhya : Indian Journal of Statistics. SCSZ—Sborník Československé Společnosti Zeměpisne. SGA—Svensk Geografisk Arsbok. SGM—Scottish Geographical Magazine. SR—Sociological Review. TPR—Town Planning Review. UE—United Empire.

(E)—English Summary. (F)—French Summary. *—Map.

GENERAL GEOGRAPHY. J. GOTTMAN, SGM, Dec. '50.—Geography and the United Nations. G. H. T. KIMBLE, J of G, Feb. '51.—Role of Geography at Mid-Century. E. G. R. TAYLOR, GJ, Dec. '50.—Origin of Continents and Oceans : a 17th Century controversy. S. V. VALKENBURG, EG, Oct. '49.—World Inventory. J. W. WATSON, SGM, Dec. '50.—Geography in Canada.

MATHEMATICAL GEOGRAPHY. J. R. MACKAY, EG, Jan. '51.—Problems and techniques in isopleth mapping. C. L. VINGE, J of G, Jan. '51.—Mercator Grid : Practical and Pedagogic Merits.

PHYSICAL GEOGRAPHY. A. J. BULL, PGA, Sep. '50.—Gravitational sliding. A. JAHN, PG, '46.—Lateral development of subsequent valleys. (E). A. JAHN, PG, '47/'48.—Note of talus in Polar regions. (E). W. OKOLOWICZ, PG, '47/'48.—Climates reconstruction based on geomorphology. (E). E. ROMER, PG, '47/'48.—Morphological problems of glaciation. (E). M. VAŠIČEK, SCSZ, '50.—Theories of origin of microatolls. (E).

HUMAN GEOGRAPHY. T. HÄGERSTRAND, SGA, '50.—Model for comparison between migration-fields and birthplace-fields. (E). R. HEINE-GELDERN, GJ, Dec. '50.—Heyerdahl's hypothesis of Polynesian origins : a criticism. R. W. HUTCHINSON, TPR, Oct. '50.—Prehistoric town-planning in Crete. F. KNIFFEN, GR, Jan. '51.—American covered bridge. J. M. MAY, GR, Oct. '50.—Map of world distribution of Poliomyelitis 1900–50.* A. H. RICHMOND, SR, Vol. XLII, 8, '50.—Economic insecurity and stereotypes as factors in colour prejudice.

SETTLEMENT. M. DOBROWOLSKA, PG, '47/'48.—Dynamisme du paysage culturel. (F).

ECONOMIC GEOGRAPHY. M. K. ELAHI, PGR, '50.—Jute, the golden fibre. A. GEDDES, PO, Autumn, '49.—Agricultural unit ; farm-labour team. B. HACKETT, PO, Autumn, '49.—Design in rural landscape. J. E. ORCHARD, GR, Jan. '51.—E.C.A. and the dependent territories. A. ZÁTOPEK, SCSZ, '50.—Economico-geographical factors in exploitation of peat (E).

TEACHING. E. S. DIX, J of G, Nov. '50.—Bringing grade school projects into the College classroom. Ed. G, Nov. '50.—New course for primary school environment study. C. HARBESON, J of G, Jan. '51.—Intermediate Geography: a reading problem. H. LATENDRESS, J of G, Jan. '51.—Geography project for upper grade level. R. S. MISAL, PE, Feb. '51.—Revised Geography syllabus (India). H. J. NELSON, J of G, Nov. '50.—Urban geography in the high school. M. O. PHILLIPS, J of G, Jan. '51.—Realism in teaching economic geography. G. T. RENNER, J of G, Feb. '51.—Learning readiness in elementary geography. Y. M. YANAL, PE, Oct. '50.—Geography dramatised.

AIDS TO GEOGRAPHICAL STUDY, BIOGRAPHY. G. F. CARTER, A of G, Dec. '50.—Isiah Bowman, 1878–1950 (Bibliog.). S. VISHER & C.Y. HU, A of G, Dec. '50.—O. E. Baker, 1883–1949 (Bibliog). G. M. WRIGLEY, GR, Jan. '51.—Isiah Bowman.

POLAR REGIONS. A. JAHN, PG, ’46.—Forms of structural soil markings in W. Greenland. (E). T. LLOYD, J of G, Nov. ’50.—Progress in West Greenland.

BRITISH ISLES. W. J. ARKELL, PGA, Apr. ’51.—Structure of Spring Bottom Ridge and origin of mud slides, Dorset. R. CASEY, PGA, Dec. ’50.—Junction of Gault and Lower Greensand in E. Sussex and Folkestone. L. V. CHILTON, SGM, Dec. ’50.—Aluminium industry in Scotland. T. EASTWOOD, PGA, Apr. ’51.—Roofing materials through the ages. G. E. FUSSELL, EG, Jan. ’51.—High farming in E. Midlands and East Anglia, 1840–1880. A. T. A. LEARMONTH, SGM, Dec. ’50.—Floods of 12th Aug., 1948, in S. E. Scotland. G. MANLEY, GJ, Mar. ’51.—Range of variation of British climate. S. W. WOOLDRIDGE, PGA, Sep. ’50.—Some features in the structure and geomorphology of the country around Fernhurst, Sussex.

EUROPE. E. ARMAO, RGI, Sept. ’50.—Descriptive list : major maps of Vincenzo Coronelli 1650–1718. (E). K. E. BERGSTEN, SGA, ’50.—Aggregative tendency in Swedish settlement. (E). K. E. BERGSTEN, SGA, ’50.—Landslide at Surte. (In Swedish. Illus.). R. BIASUTTI, RGI, March, ’51.—Man and the environment. (E). E. BONETTI & C. SHIFFRER, RGI, Sept. ’50.—Urban and rural population in Istria. (E). O. G. S. CRAWFORD, GJ, Dec. ’50.—Some linear earthworks in the Danube Basin. E. EKHART, GA, ’50.—Bewölkungsklimatologie der Alpen. E. EKHART, GA, ’50.—Temparaturfeld der Alpen und seine Jahresperoide. D. GRIBAUDI, RGI, Mar. ’51.—Origin of hill top settlements. (E). S. GRUNDSTRÖM, SGA, ’50.—Quelques traits de l’évolution de la peche aux Iles Lofoten. (F). D. HANNERBERG, SGA, ’50.—Rationalization of Swedish Farming, from medieval “ Sun Division ” to Agricultural Reform Act of 1947. (E)., G. HOPPE, GA, ’50.—Glacifluvial drainage in interior Norrbotten. J. KUNSKY, SCSZ, ’50.—Periglacial structural soils in Giants Mountains. V. LEBAN, GV 50.—Nanos. Les rapports économiques avec les régions voisines (F.) S. LIPOGLAVŠEK, GV, ’50.—Emigration of Slovenes (E). S. MAJDANOWSKI, PG, ’47–’48.—Distribution, density and directions of lake-channels of the Polish lowlands (E). A. L. MINKES, IA, ’51.—Economic development of E. Europe. K. MOLIN, SGA, ’50.—Deserted habitations and depopulation in the parish of Järnboås (E). L. PEDRESCHI, RGI, Sept. ’50.— Rural settlement of the Plain of Lucca (Tuscany) ; corti (E). C. E. QUENSEL, SGA ’50.—Regional distribution of marriages in different types of parishes in Sweden (E). S. Z. RÓZYCKI, PG, ’46.—Contributions à la connaissence de phénomènes Karstiques en Pologne (F). R. N. RUDMOSE BROWN, SGM, Dec. ’50.—Svalbard of today. H. SMEDS, SCA, ’50.—Emerging Skerryguard-coast of Ostrobothnia, Finland (F). B. G. SVENSON, SGA, ’50.—Fruit farms on E. coast of Skåne ; economic geographical conditions (E). J. TRIFUNOSKI, BGB, ’50.—Elevage du bétail sur la montagne de Zeden, Yugo-Slavia (F). C. G. WENNER, GA, ’50.—Deltas and terraces of river Viskan, Sweden.

ASIA. S. D. AHMAD, PGR, ’50.—Role of Geography in national planning, Pakistan. R. A. BAGNOLD, GJ, Mar. ’51.—Sand formations in S. Arabia. M. T. BUTT, PGR, ’50.—Climate of the Pak Punjab. M. H. CHEN, JC, Dec. ’48.—Geographical note on Lower Tatungho Region, Tsinghai. S. P. CHEN, JC, Dec. ’48.—Geomorphology of Tan-Lung Chuan Valley, Yunnan. DEPT. OF IRRIGATION, BAHAWALPUR STATE, PGR, ’50.—Abbasia Canal Project, Bahawalpur. L. EN-LUM, JC, Dec. ’48.—Highland settlements : their geographical environment and problems. A. GHOSH, S, Nov. ’50.—Note on marginal and optimum sixe of holding in Bengal. R. H. HUGHES, GJ, Mar. ’51.—Hong Kong : an urban study. MEI-NGO JEN, JC, Sept. ’50.—Geographical distribution of crop productivity in Szechuan Province. K. U. KUREISHY, PGR, ’50.—Choice of Pak Capital : Politico-geographical analysis. P. C. MAHALANOBIS, S, Mar. ’49.—Anthropometric Survey of United Provinces 1941. A. A. RIZAVI, PGR, ’50.—Natural regions of E. Pakistan. W. THESIGER, GJ, Dec. ’50.—Desert borderlands of Oman. W. THESIGER, GJ, Mar. ’51.—S. E. ARABIA : map of Traverses 1945-50.* WAN-RU TSAO, JC, Sept. ’50.—Relative relief map of Fukien, China.* Various authors, BGSC, July, ’48.—Geology of coalfields, Kansu, Shensi, Sinkiang. JEN-CHANG YANG, JC, Sept. ’50.—Climate of N.E. China. C. S. YAO, JC, Sept. ’50.—Climate of Hangchow. C. S. YEN, JC, Dec. ’48.—Physical landscape in Sikang Province. S. ZOHA, PGR, ’50.—Physiographical personality of Baluchistan.

AFRICA. M. A. BHATTY, PGR, ’50.—Comparative agricultural geography of Barbary. E. GORDON, GJ, Dec. ’50.—A Land Use map of Kuntaur in the

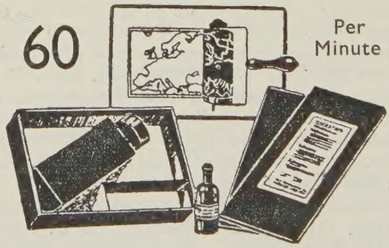
Gambia.* H. R. JARRETT, SGM, Dec. '50.—Geographical regions of the Gambia. W. A. MACFADYEN, GJ, Dec. '50.—Vegetation patterns in semi-desert Plains of British Somaliland. H. MORESTIN, COM, Jan. '50.—Faubourgs indigènes de Rabat. R. R. RAWSON, EG, Jan. '51.—Emigration to British East and Central Africa. E. B. WORTHINGTON, UE, Nov.–Dec. '50.—Uganda is alive by itself.

NORTH AMERICA. W. CALEF, EG, Jan. '51.—Salines of south-eastern California. W. CALEF, A of G, Dec. '50.—Winter of '48/'49 in Great Plains. R. M. CRISLER, J of G, Nov. '50.—Regional status of little Dixie in Missouri and Little Egypt in Illinois. W. J. EITEMAN & A. B. SMUTS, EG, Jan. '51.—Alaska, Land of Opportunity-Limited. O. W. FREEMAN, J of G, Feb. '51.—Three Pacific Northwest Dams. R. L. IVES, A of G, Dec. '50.—Frequency and effects of Chinook winds in Colorado. R. I. WOLFE, EG, Jan. '51.—Summer Cottagers in Ontario.

LATIN AMERICA. E. BÖLAU, SGA, '50.—Geologic structure and morphology ; importance as culturgeographic factors in Central Minas Gerais, Brazil (E). G. B. CRESSEY, J of G, Nov. '50.—Asia looks at Latin America. L. N. DAMBAUGH, J of G, Feb. '51.—Appreciation of the Puerto Ricans. C. LANGDON WHITE, J of G, Jan. '51.—Huancayo and its famous Indian market in the Peruvian Andes. D. M. POOLE, GJ, Mar. '50.—Spanish Conquest of Mexico : Geographical aspects. E. REVERT, COM, Jan. '50.—Problèmes de de géographie antillaise. W. E. RUDOLPH, GR, Jan. '51.—Chuquicamata twenty years later. J. SERMET, COM, '50.—Paraquay.

OCEANS. T. HEYERDAHL, GJ, Mar. '51.—Voyaging distance and voyaging time in Pacific migration. G. H. LAW, J of G, Jan. '51.—Recent cultural changes on the island of Nauru. J. S. ROUCEK, J of G, Jan. '51.—Geopolitiks of the Aleutians.

60



Per Minute

THE GREATEST TIME-SAVER IN THE TEACHING OF

GEOGRAPHY . HISTORY
BIOLOGY . BOTANY
RELIGIOUS INSTRUCTION
JUNIORS, etc.

READY FOR IMMEDIATE USE

Rolls available ;

WORLD (5) . HEMISPHERES
CONTINENTS.COUNTRIES
TOWNS . SPECIAL AREAS
CONTOURS . OCEANS
SEAS . RIVERS
HISTORICAL COSTUMES
TRANSPORT . NATURE STUDY

M140 LONDON (2)
Showing :
Main Line Termini
Main Thoroughfares
Places of Interest
and FESTIVAL OF BRITAIN, 1951
(Key to Landmarks supplied)
As supplied to the Public Schools, Admiralty, War Office and Air Ministry.

THE MAPOGRAPH CO. LTD.

440 HIGH ROAD :: CHISWICK :: LONDON, W.4

Telephone ; CHIswick 5635 *Established* 1923

GEOGRAPHICAL ASSOCIATION

SECTIONS AND STANDING COMMITTEES OF THE ASSOCIATION

Primary Schools Section Committee :

Chairman : Mr. M. Murphy.
Secretary : Mr. G. H. Burden, 15, Tyson Road, Forest Hill, London, S.E.23.
Committee : Miss S. Bayliss, Messrs. S. R. Payne, W. Wakefield, A. F. Sprange.

Public and Preparatory Schools Section Committee :

Chairman : Professor J. A. Steers.
Secretary : Mr. P. T. Marsden, The Limes, Rushmere St. Andrew, Ipswich.
Committee : Miss M. A. Arber, Mr. R. G. Avent, Mr. J. N. L. Baker, Mr. R. F. B. Campbell, Professor H. C. Darby, Messrs. R. W. Gibb, W. V. Lewis, H. D. R. P. Lindsay, G. W. Newberry, H. H. Starr (Rep. serving on Executive Committee), R. W. Steele, W. R. Taylor (Editor of *Gazette*), J. W. Thompson, R. D. Young.

Secondary Schools Section Committee :

Chairman : Mr. C. B. Thurston (G.)
Secretary : Mr. J. B. Goodson (M.), Oakwood, St. Andrews Avenue, Colchester.
Committee : Misses Beachem (M.), E. A. Brown (G.), L. M. Budden (G.), P. Cutting (M.), Mrs. D. R. Martin (M.), Messrs. G. A. Bunker, R. Cole (G.), L. B. Cundall (G.), R. J. Evans (G.), A. J. Garrett (M.), G. A. German (G.), P. R. Heaton (G.), N. K. Horrocks (G.), W. H. Hoy (M.), J. H. McBride (G.), J. A. McIver (G.), E. F. Mills (T.), J. C. Parrack (G.), J. A. Morris (G.), G. H. Skinner (M.), L. S. Suggate (G.), J. Wilson Main (M.).
(G.—Grammar School, M.—Modern School, T.—Technical School).

Training Colleges Section Committee :

Chairman :
Vice-Chairman : Mr. D. W. Shave.
Secretary : Miss R. F. Carr, 7, Denbigh Gardens, Richmond, Surrey.
Committee : Misses O. Garnett, G. M. Hickman, D. M. Higgs, E. R. Payne, I. V. Young, Messrs. G. B. Bull, E. B. Dobson, C. L. Heywood, B. S. Roberson.

STANDING COMMITTEES :

Standing Committee for Visual Aids in the Teaching of Geography :

Chairman :
Secretary : Mr. E. F. Mills, 29, Egmont Road, Eastbourne, near Midhurst, Sussex.
Committee : Misses P. Jeffery, M. Simpson, Mrs. M. Long, Messrs. A. Arkinstall, T. Brown, G. Campbell, G. J. Cons, P. R. Heaton, R. C. Honeybone, J. C. Parrack, F. A. Ring.

Standing Committee for Urban Spheres of Influence :

Chairman : Mr. A. E. Smailes.
Committee : Dr. H. E. Bracey, Mr. G. E. Hutchings.

Full Membership : This is open to all who are interested in Geography or in Education, and entitles members to the privileges of receiving the magazine, *Geography* (formerly *The Geographical Teacher*), post free, four times per year, and of using the library (postal or personal) which contains 8,200 books, 1,418 volumes of journals and 3,100 lantern slides. On postal library loans members pay postage both ways. The Life composition fee is £10. The subscription for annual membership is 12/6, payable in January, 1951 ; the next subscription falls due in September, 1951, following the change in the membership year (see Association Notes, Vol. XXXVI, March, 1951, p. 60). Subscriptions paid after June 30th, 1951, will be regarded as subscriptions for the following membership period, September, 1951, to August, 1952.

Branch Membership : Local Branches may charge a fee to members participating in their activities ; this fee is additional to the above-mentioned subscriptions.

Student Membership : Students in universities and training colleges and senior pupils in secondary schools may be enrolled as members at a specially reduced rate ; only *bona fide* students may benefit by this. Applications should be accompanied by a certificate of studentship. Further details may be obtained from the Assistant Secretary.

School Membership : Special attention is drawn to the arrangements whereby a college or school may subscribe to receive *Geography* and to use the Library, paying £1–5/– per year, and having the right to borrow six books at a time, the school paying postage both ways. Responsibility for the loans must be undertaken by the Principal, Head or recognised lecturer or teacher.

Cheques and postal orders in payment of subscriptions should be crossed and made payable to the Geographical Association. They should be sent to the Assistant Secretary, Geographical Association, c/o The Park Branch Library, Duke Street, Sheffield, 2. Branch members may pay their full subscriptions through their local branch secretary or treasurer.

HARRAP

The Earth's Crust

L. DUDLEY STAMP, C.B.E., M.A., D.Sc.

This book constitutes a new approach to physical geography and geology, and is divided into four parts. In Part I the ever-changing surface of the earth (i.e. denudation and deposit) is described in fifteen sections, including an explanation of what the crust is, and the effects of action by sun, rain, frost, and other elemental forces. Part II, "Mountain-building," is largely concerned with earthquakes and their consequences, and Part III takes in different aspects of structure and scenery. In conclusion, Part IV deals with "Rocks, Minerals, and Man." Long captions to the many and excellent illustrations provide in themselves interesting and admirably instructive material for readers. Especially attractive and noteworthy are the illustrations in colour, which have been made from hand-built models, expertly constructed to give three-dimensional effect. 18s. net

A detailed prospectus is available

182 High Holborn London, W.C.1

GEOGRAPHICAL ASSOCIATION

The following may be obtained from the Assistant Secretary, Geographical Association, c/o The Park Branch Library, Duke Street, Sheffield, 2.

1. Local Studies. Revised and Enlarged edition (1949) prepared by members of the Standing Committee for Geography in Secondary Schools. Price 3/–, post free; if supplied through a bookseller, 3/3.
2. Catalogue of the Library of the Association. (Out of print; a new edition is in course of preparation.)
3. Suggestions for the Teaching of Geography. Drawn up by the Standing Committee for Geography in Primary Schools. New edition, 2/–, post free; if supplied through a bookseller, 2/3.
4. Class and Reference Books in Geography for Form VI. 8d., post free.
5. University Scholarships and Entrance requirements. 6d., post free.
6. Lantern Slide Catalogue Sheets with Notes (53 sets). Price for the set, 9/–, including postage. Single Catalogue Sheets, 7d. Lists of Sets of Slides free if stamped addressed envelope is sent.
7. Set of 6 O.S. Maps (4th edition) with National Grid on 2. Size 15 × 12 in. 4/6 for a single set, 4/3 per set if bought in quantity: if supplied through a bookseller 4/9 for a single set, 4/6 per set if bought in quantity: (Cairngorms, South Downs, Mid-Severn Valley, South Wales Valleys; water and contour only of the last two).
8. Set of 33 pictures to accompany the Association's O.S. Maps, 2/3; if supplied through a bookseller, 2/6.
9. Set of 4 geological maps to accompany the Association's set of O.S. Maps, 2/6 for a single set, 2/– per set if bought in quantity: if supplied through a bookseller, 2/9 for a single set, 2/3 per set if bought in quantity.
10. French Life and its Problems. H. J. Fleure, 3/10, post free.
11. Current list of back numbers of *Geographical Teacher* and *Geography* available for purchase. 3d. post free.
12. Geography and Air Photographs. D. L. Linton, 1/8, post free.
13. Careers memorandum, 3d., post free.
14. Reprints of Lists of geographical articles in magazines received; to be ordered in advance. 6d. each.

Water and contour "pulls" of ¼ in., 1 in. and 2½ in. maps can be ordered from the O.S. by the G.A. on request. For details, enquire from the Assistant Secretary.